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Colstrip Hearings

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VOLUME 24

Transcript of Proceedings

February 10, 1976

TUESDAY, FEBRUARY 10, 1976

The hearing reconvened at 9:25 A.M. on Tuesday, February 10, 1976, in the Chambers of the Montana House of Representatives, State Capitol, Helena, Montana.

The Honorable Carl M. Davis, Hearings Examiner, presided over the proceedings.

APPEARANCES:

Applicants:

William M. Bellingham, Esq.
John L. Peterson, Esq.
John Ross, Esq.

Department of Natural Resources and Conservation:

Arden E. Shenker, Esq.
Donald MacIntyre, Esq.
Ted J. Doney, Esq.

International Brotherhood of Electrical Workers (AFL-CIO):

Benjamin W. Hilley

Northern Cheyenne Tribe, Inc.:

Peter Michael Meloy

The following proceedings were had:

HEARINGS EXAMINER: Let's commence, Mr. Hilley.

MR. HILLEY: The IBEW will call Dr. Paul Polzin to the stand.

DR. PAUL E. POLZIN, called as a witness by the International Brotherhood of Electrical Workers, having been first duly sworn upon his oath, both as to his written direct testimony and as to the oral testimony to follow, was examined and testified as follows:

MR. SHENKER: Mr. Davis?

HEARINGS EXAMINER: Mr. Shenker?

MR. SHENKER: Before the IBEW proceeds further at this hearing, although I am delighted to see them now some nine months after we've started, I believe that there are two pending matters; first is an actual formal motion that was filed on behalf of one of the parties at this proceeding barring the IBEW from proceeding at all because of their willful failure to answer interrogatories, and requesting sanctions upon them for their non-compliance with the Hearings Examiner's orders. We are not the moving party on that motion, but the files will show that that is pending. Secondly, interrogatories have been served upon the IBEW to which we are parties, and on which we have not had answers; and I think that those preliminaries should be resolved. I called them to the attention of the Hearings Examiner on the record at the hearing yesterday.

HEARINGS EXAMINER: Very well; thank you, Mr. Shenker. We have a motion that was filed by the Northern Plains Resource Council, received by me on June 12, 1975, stating that answers to interrogatories haven't been filed, and for sanction the motion is denied. Now how do you want to proceed on your motion; there were some supplemental answers filed to your interrogatories --

there were some objections filed to the interrogatories by yourself, and I don't have anything else formally filed other than a copy of a letter that you sent to Mr. Hilley regarding certain interrogatories.

MR. SHENKER: Well, it depends on how formal we want to be, Mr. Davis. If we wanted to be completely formal, then all of our objections that are still pending would have to be ruled upon. I think that that's a little silly.

HEARINGS EXAMINER: Well, that's all right; I can rule on them in a hurry.

MR. SHENKER: We all have notice of the extent to which the answers have been made to the interrogatories, and to fill this record with pure balderdash propaganda of one or more of the parties being pro union or anti union, I think is improper. Therefore, such answers as appear, against which we have moved, against which we have interrogatory objections, should be stricken, and others where they indicate that they have to give us further information, I think that the Hearings Examiner should rule that they must do what the law requires and give us the further information. If these were not idle interrogatories; they were filed pursuant to the Hearings Examiner's orders. There are only four of them, as I recall, in which we have any matters still pending. The Hearings Examiner will recall that we've tried to work these matters out informally by letter in the past; we still have four items in which there are controversies.

HEARINGS EXAMINER: Now, on your objections to interrogatories that you filed with me on behalf of the Department of Natural Resources, subsequent to that time there were supplemental interrogatories filed. There are only four interrogatories now that I have received anything supplemental on, and that's contained in your letter of August 15; and is that the ones that you refer to?

MR. SHENKER: Yes, those are the only four remaining in which we have objections that should be resolved. Interrogatory number 52 is one in which the IBEW said they would supply us with further information; that has not been done.

HEARINGS EXAMINER: Is there any further information, Mr. Hilley, to number 52 that you are aware of?

MR. HILLEY: May I have just a moment?

HEARINGS EXAMINER: Surely.

MR. HILLEY: I guess in answer to this, copies, apparently, have not been secured even to this day. It is rather difficult finding local unions who might have written letters and, in many cases, do not have carbon copies and, in some cases, might have. As far as we're concerned, this is a very technical objection. In other words, what relevancy does this have to the proceedings?

HEARINGS EXAMINER: Now, Mr. Hilley, do you have any comment or reply or response to make to the matters raised by Mr. Shenker in regard to Interrogatory number

7 in his letter of August 15; do you have that letter?

MR. HILLEY: I don't have it, Mr. Hearings Examiner, because I didn't realize that there would be a motion to this effect. As far as we're concerned, we have answered what we can answer. I don't think that we can take it much further than that. So many of the questions in the interrogatories address themselves to speculation, address themselves to facts and information that we must obtain from the applicants. As far as these technical questions, we've tried to make guesses, we've tried to submit this information. However, the remaining four, as far as we're concerned -- I don't have it in front of me, but as I recall one of them they want to know our union dues and so forth.

MR. SHENKER: You already answered that.

HEARINGS EXAMINER: That's been answered, yes.

MR. HILLEY: Okay. Then it might be nice to have a copy in front of me. However, to go ahead and talk, as far as we're concerned, they are answered.

HEARINGS EXAMINER: Well, if you feel in good faith that you've tried to supply the information that has been available to you on this --

MR. HILLEY: Yes. I can't say whether or not we have tried to supply the correspondence to the Governor's Office. We were trying to secure these letters; the only thing about it is that I really, can't frankly, represent to you where those letters are. I'm sure they must be in the Governor's Office. However, as far as what unions wrote what letters, perhaps we have been remiss in not trying to secure them, and I'm sure the reason why we did not is we considered it quite immaterial anyhow.

HEARINGS EXAMINER: Very well. If yours is in the form of a motion to strike any material relating to the unanswered interrogatories, I suppose --

MR. SHENKER: No, I should make it more specific, Mr. Davis. As to the four items, Interrogatory number 7 has as its prelude to its answer, "it seems ironic that no one seems to be aware of the tremendous unemployment in Montana." I believe that that is unresponsive in the extreme, and that language should be stricken. The end of Interrogatory number 7 --

HEARINGS EXAMINER: All right, we'll strike that.

MR. SHENKER: Thank you. The end of Interrogatory number 7 refers to some unemployment figures, and gives us some of the data which we requested, and concludes with, "The numbers of unemployed members of the union are being researched through the locals and will be provided." Now that's information peculiarly within the ken knowledge and ability to provide of this party. It has not been provided.

MR. HILLEY: Mr. Hearings Examiner, I'd like to respond to this; that's in the statement. We were able to accumulate this information; each month, each day, the picture changes. The latest information was submitted in January in the statement of Russell Williams which is a compilation of those unemployment figures, or at least the hiring hall figures and things that have been asked for.

MR. SHENKER: That's not the latest information, that's the earliest information because it's the first information that we've had. I did not know until now that that was an attempt to be responsive to the interrogatory.

HEARINGS EXAMINER: Well, notwithstanding, if the information was served on the 9th or 10th, I would feel that that would be adequate time to prepare for cross-examination on that subject or take depositions; so that motion, in regard to that, would be denied. Now is that still number 7 you were speaking to?

MR. SHENKER: Yes.

HEARINGS EXAMINER: How about number 19; do you want to make a specific objection or motion to it?

MR. SHENKER: Yes, we wanted to know how many members of the union, that is card-carrying members of the union, were employed in connection with the Colstrip projects; the answer was, "All electrical workers have cards." Well, that's interesting. Local 532 evidently does not issue work permit cards, but the real question is what percentage of the employees operating out of Billings local 532 had work permit cards.

MR. HILLEY: We have responded to this about three times. Now we're getting tired of it. The IBEW does not have work permit cards. We have answered that they do not have work permit cards. Mr. Shenker keeps asking how many or what percentage have work permit cards to which we will still reply there are no work permit cards in the IBEW.

HEARINGS EXAMINER: Very well, the answer will stand on that one. How about on the next one, number 44?

MR. SHENKER: I must say, Mr. Davis, that we now have a statement from Mr. Hilley that is sworn to in the interrogatories, signed by Mr. Williams, that all electrical workers have cards, and we have the statement from Mr. Hilley today that none of them have cards. Is this a multiple choice quiz?

HEARINGS EXAMINER: You're talking about two different kinds of cards, aren't you; work permit cards or union cards?

MR. HILLEY: Two completely different types of cards. One are membership cards, the other are work permit cards. Now we have answered, like I said, there are no work permit cards. Every union member has a membership card, but this was not the question.

HEARINGS EXAMINER: Very well. You can examine Mr. Williams regarding that when he gets on the stand. How about number 44?

MR. SHENKER: That to us is really the most important of the interrogatory information that we sought. What we have received is game playing. Mr. Hilley tells us he can't understand the language bause he doesn't know what the term employment force means. What we'd like to know is of the members of the union, how many of them were asked for their views; and of those who are at work on the projects, how many were asked for their views; and of those who are workers, how many were asked for their views. Now I don't find that very difficult language to understand, but there has been no answer at all.

HEARINGS EXAMINER: Very well. The motion will be denied as to that one; you can ask him on the stand if there's any information that's available. Now number 54.

MR. SHENKER: I think the letter of August 15 states that, again, we have no answer to the question of whether the people named as folks who participated in the answers to the interrogatories, all answered all of the interrogatories; that's what we want to know.

HEARINGS EXAMINER: Very well. Your motion is denied as to that; you can ask him on the stand. Okay, you can proceed with your cross-examination or any other motions you may have.

(THE WRITTEN DIRECT TESTIMONY OF DR. PAUL E. POLZIN WAS DIRECTED TO BE INSERTED AT THIS POINT.)

STATE OF MONTANA

BEFORE THE BOARD OF

NATURAL RESOURCES AND CONSERVATION

IN THE MATTER OF THE PUBLIC HEARING ON)
WAIVERS AND THE APPLICATION FOR CERTIFICATE)
OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC)
NEED FOR THE PROPOSED COLSTRIP PROJECT,)
UNITS 3 & 4, WHEREIN THE APPLICANTS FOR)
SAID WAIVERS AND APPLICATION ARE PUGET SOUND)
POWER & LIGHT COMPANY, PORTLAND GENERAL)
ELECTRIC COMPANY, WASHINGTON WATER POWER)
COMPANY, PACIFIC POWER & LIGHT COMPANY, AND)
THE MONTANA POWER COMPANY.)

STATEMENT OF TESTIMONY OF PAUL E. POLZIN

Submitted on behalf of
INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS

HILLEY & LORING
Attorneys at Law
1713 Tenth Avenue South
Great Falls, Montana 59405

STATEMENT OF TESTIMONY OF PAUL E. POLZIN

My name is Paul E. Polzin, may home address is 2705 South Hills Drive, Missoula, Montana. I have been a Research Associate at the Bureau of Business and Economic Research, University of Montana, Missoula, Montana, since 1968. I also hold the rank of Associate Professor in the Department of Management.

I attended the University of Michigan and received an A.B. degree in Economics in 1964. I also earned M.A. and Ph.D. degrees in Economics from Michigan State University; both were granted in 1968. Since 1968, I have worked at the Bureau of Business and Economic Research at the University of Montana and have conducted extensive research on Montana's economy. I was a co-author of the Montana Economic Study (Bureau of Business and Economic Research, University of Montana, 1970) and Economic Report to the Governor (Bureau of Business and Economic Research, University of Montana, 1974). Among my other publications are Water Use and Coal Development in Eastern Montana (Bureau of Business and Economic Research, University of Montana, 1974) and "A Survey of Montana College Graduates," (Montana Business Quarterly, Autumn, 1972). I have also published extensively on topics dealing with regional economics in scholarly journals.

I

Montana's Economy from 1950 to 1970:
Two Decades of Slow Growth

Montana was unusually prosperous in the years immediately following World War II, thanks largely to the favorable conditions in agriculture. The situation changed, however, beginning about 1950, when Montana's economy turned lackluster. From 1950 to 1970, the state experienced periods of above-average prosperity, but they were due mostly to unusually good years in agriculture or to other isolated events. In general, Montana's economic position relative to the rest of the nation deteriorated significantly. There is not the time to document these events; they are adequately discussed in the Montana Economic Study and elsewhere. Instead, I will simply summarize some of the major conclustions so that Montana's current economic situation may be put into its proper perspective.

I begin by examining population trends because, underneath it all, an economy consists of people. Table 1.1 reports the population of Montana and the United States during 1950, 1960, and 1970. These figures show that during the fifties Montana's population increased significantly, but at a rate below that of the United States: the number of Montanans grew from 591,000 to 675,000, or 14.2 percent, while the nation's population rose from 151.3 million to 179.3 million, about 18.5 percent. Between 1960 and 1970 the disparity between Montana and the United States reached dramatic dimensions. By 1970, the number of Montanans had inched upward to 694,000, a 2.8 percent gain from 1960, while the nation's population grew to 203.2 million, up 13.3 percent during the decade.

The growth of the nation's population was due primarily to an excess of births over deaths, but Montana's slow population growth cannot be attributed to either of these factors. In fact, Montana's birth rate was slightly above the national average and its death rate was about the same as elsewhere in the nation. Rather, the slow growth rate of population was primarily due to net migration, a factor which played only a minor role for the nation. Table 1.1 shows that during the fifties about 25,000 more persons left the state than moved in. Between 1960 and 1970 this figure rose to 58,000, representing over 8 percent of the 1960 population.

Montana was certainly not alone in experiencing net outmigration. Between 1960 and 1970, almost one-half of the states lost more people than they gained. But, Montana's net loss was far more severe than most. As is shown in table 1.2,

Table 1.1

Resident Population of Montana and the United States
1950-70

	Resident Population			*Percent Change*		Net Migration	
	1950	1960	1970	*1950-60*	*1960-70*	1950-60	1960-70
Montana	591,000	675,000	694,000	*14.2*	*2.8*	-25,000	-58,000
United States	151,326,000	179,323,000	203,185,000	*18.5*	*13.3*	2,462,000	2,020,000

Sources: U.S. Bureau of the Census, *Current Population Reports*, Series P-25, No. 304 (table 4) and No. 460 (table 3). Percentages derived.

Table 1.2

Net Migration for States, 1960 to 1970

		Net Migration					Net Migration		
		Number	*Percent*[a]	Rank[b]			Number	*Percent*[a]	Rank[b]
1	Alabama	-233,000	*-7.1*	42	26	Nebraska	-73,000	*-5.2*	37
2	Arizona	228,000	*17.5*	3	27	Nevada	144,000	*50.4*	1
3	Arkansas	-71,000	*-4.0*	34	28	New Hampshire	69,000	*11.3*	7
4	California	2,113,000	*13.4*	4	29	New Jersey	488,000	*8.0*	12
5	Colorado	215,000	*12.3*	6	30	New Mexico	-130,000	*-13.6*	48
6	Connecticut	214,000	*8.5*	10	31	New York	-101,000	*-0.6*	27
7	Delaware	38,000	*8.5*	11	32	N. Carolina	-94,000	*-2.1*	32
8	D.C.	-100,000	*-13.1*	47	33	N. Dakota	-94,000	*-14.9*	51
9	Florida	1,326,000	*26.8*	2	34	Ohio	-126,000	*-1.3*	31
10	Georgia	51,000	*1.3*	20	35	Oklahoma	13,000	*0.6*	21
11	Idaho	-42,000	*-6.2*	39	36	Oregon	159,000	*9.0*	8
12	Illinois	-43,000	*-0.4*	26	37	Pennsylvania	-378,000	*-3.3*	33
13	Indiana	-16,000	*-0.3*	25	38	Rhode Island	13,000	*1.5*	17
14	Iowa	-183,000	*-6.6*	41	39	S. Carolina	-149,000	*-6.3*	40
15	Kansas	-130,000	*-6.0*	38	40	S. Dakota	-94,000	*-13.9*	49
16	Kentucky	-153,000	*-5.0*	36	41	Tennessee	-45,000	*-1.3*	30
17	Louisiana	-130,000	*-4.0*	35	42	Texas	146,000	*1.5*	18
18	Maine	-69,000	*-7.2*	43	43	Utah	-11,000	*-1.2*	29
19	Maryland	385,000	*12.4*	5	44	Vermont	15,000	*3.8*	14
20	Massachussets	74,000	*1.4*	19	45	Virginia	141,000	*3.6*	15

Table 1.2 - (continued)

		Net Migration		
		Number	*Percent*[a]	Rank[b]
21	Michigan	27,000	*0.3*	22
22	Minnesota	-25,000	*-0.7*	28
23	Mississippi	-267,000	*-12.3*	46
24	Missouri	2,000	*0.1*	23
25	Montana	-58,000	*-8.6*	44
46	Washington	249,000	*8.7*	9
47	W. Virginia	-265,000	*-14.2*	50
48	Wisconsin	4,000	*0.1*	24
49	Wyoming	-39,000	*-11.9*	45
50	Alaska	16,000	*7.1*	13
51	Hawaii	11,000	*1.7*	16

Source: U.S. Bureau of the Census, *Current Population Reports*, Series P-25, Number 460, Table 3. Rank derived.

[a] Based on population at beginning of period.

[b] Rank with respect to the net migration rate.

we ranked forty-fourth out of the fifty states and the District of Columbia.

The excess of outmigrants may appear suprising, especially since we often hear that Montana is such a wonderful place to live and that many people are anxious to move here. But, the facts are clear; those moving to Montana were far outnumbered by those fleeing. The net migration data may underemphasize the number of persons involved. Table 1.3 presents the gross flow of people to and from Montana between 1965 and 1970. (Unfortunately, the U.S. Census Bureau does not provide gross migration information for the entire 1960 to 1970 decade.) These figures show that during this one five year period almost 104,000 persons left Montana while only 72,000 entered.

It is sometimes alleged that Montana's rural setting and way of life attract many persons disillusioned with the frantic pace of city life. The figures from the U.S. Census Bureau shown in table 1.4 suggest that the image of city dweller's escaping to Montana just isn't true. In fact, a current picture would show many more Montanans moving to urban areas. Between 1965 and 1970, approximately 32,000 persons migrated to Montana from urban areas (as defined by the U.S. Census Bureau). During the same period, 58,000 Montanans left for these cities. It is interesting to note that outmigration exceeded inmigration for nonurban areas, but by only 5,938 persons. Thus, over 80 percent of Montana's total net outmigration of 31,711 between 1965 and 1970 was caused by the drain to the cities.

These statistics contradict widely held beliefs about Montana; namely, that we are being overrun by outsiders. It is probably human nature that new people, with their speech characteristics or out-of-state license plates, are noticed immediately. But, the persons moving from Montana are often forgotten simply because they are no longer visible.

Some people may view these figures with glee; they feel that Montana is already overcrowded and this exodus will help to maintain treasured lifestyles.

Table 1.3

Migration to and from Montana
1965-1970

	Persons Five Years Old and Over
1970 resident population	637,336
1965-1970 migration	
Inmigrants	71,828
Percentage of 1970 population	*11.3*
Outmigrants	103,599
Percentage of 1970 population	*16.3*
Net migrants	-31,771
Percentage of 1970 population	*5.0*

Source: U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Subject Reports, Migration Between State Economic Areas*, Final Report PC(2)-2E (Washington, D.C.: U.S. Government Printing Office, 1972), table 4. Totals derived.

Table 1.4

Migration between Montana and Urban Areas
1965-1970

	---------------- Montana	----------------	
	Inmigrants	Outmigrants	Net Migrants
All interstate migrants	71,328	103,599	-31,771
Urban state economic areas[a]	32,167	58,000	-25,833
Percentage of total interstate migrants	*44.8*	*56.0*	*81.3*
Nonurban state economic areas	39,661	45,599	-5,938
Percentage of total interstate migrants	*55.2*	*44.0*	*18.7*

Source: U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Subject Reports, Migration Between State Economic Areas*, Final Report PC(2)-2E (Washington, D.C.: U.S. Government Printing Office, 1972), table 4. Derived.

Note: The data pertain to persons five years of age and over in 1970.

[a] Standard Metropolitan Statistical Areas (SMSAs) with a central city population of 50,000 or more and a total population of 100,000 or more in 1960. These areas are multicounty aggregates and include the suburbs of large cities.

But, this is a very shallow and selfish viewpoint. I think the migration statistics are actually a symptom of a serious malady affecting Montana's economy; specifically, there were an insufficient number of new jobs created and many persons were forced to leave the state in search of work.

People move for many reasons. It would be an impossible task to interview each and determine his or her motives. But, there is some hard evidence that a significant portion of those leaving did so because they could not find a job in the state. A recent study of Montana college graduates between 1975 and 1970 found that about 77 percent wanted to stay and work in state but only 58 percent actually remained.[1] The major reason for this discrepency was their inability to find suitable employment. These findings apply only to college graduates. The plight of the average working man or woman with fewer qualifications and less impressive credentials, may be far worse.

The overall trend in the labor market are shown in the employment and unemployment figures for Montana and the United States between 1957 and 1970 (1957 is the earliest year for which reliable Montana data are available). Looking first at figure 1, we see that employment in Montana grew at a much slower rate than did employment in the nation as a whole. Abstracting from the minor peaks and troughs, Montana's employment grew by about 12 percent between 1957 and 1970, as compared to almost 23 percent in the United States. The unemployment data shown in figure 2 tell much the same story. Montana's unemployment rate generally follows the same up and down pattern as that for the United States; but, with several exceptions, it averaged about one full percentage point above the national figure. Thus, these data clearly suggest that Montana's economy was not creating jobs as fast as the national economy, and that employment

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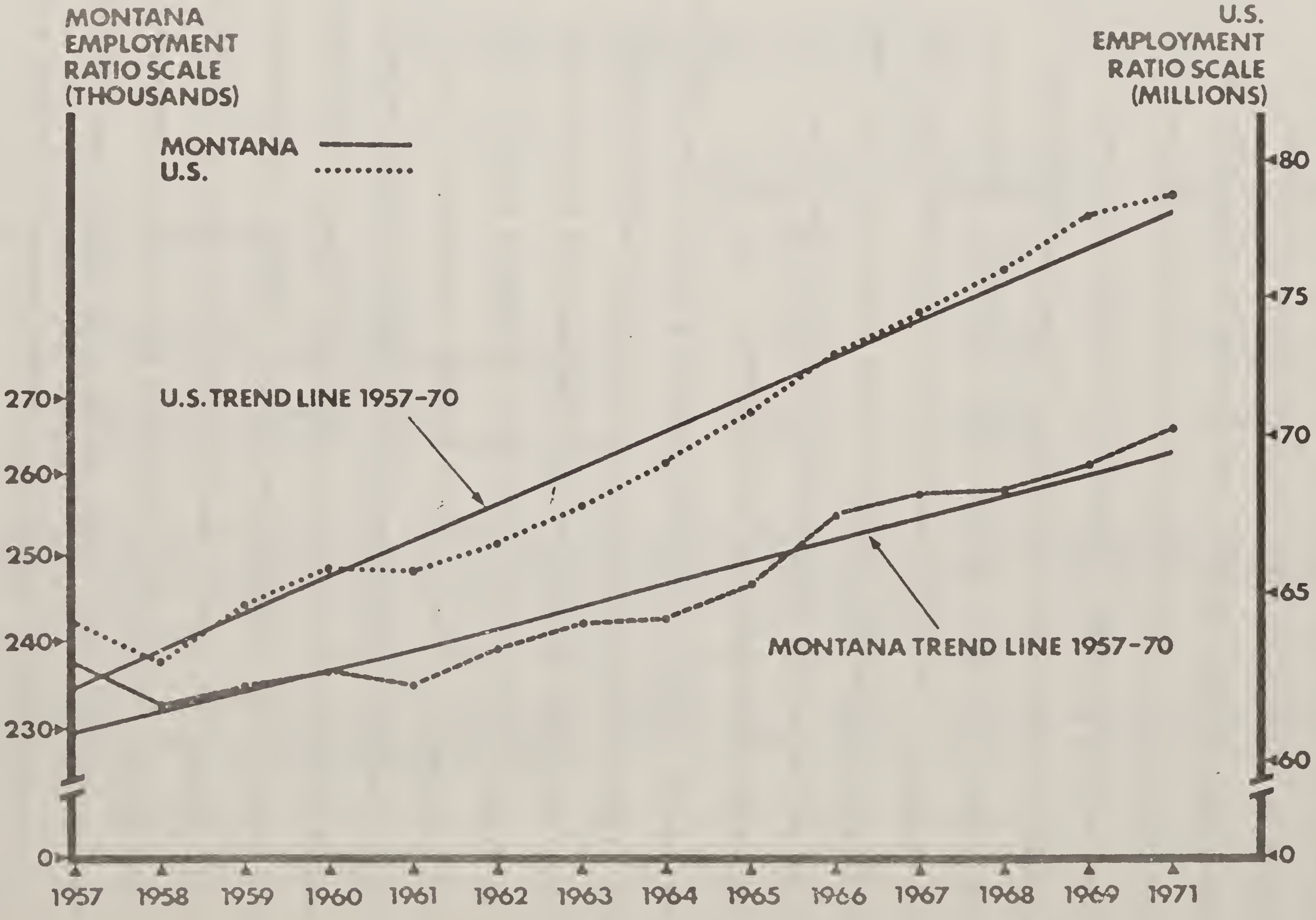
[1] Paul E. Polzin, "Special Report: Why They Leave, A Survey of Montana College Graduates," Montana Business Quarterly, Bureau of Business and Economic Research, University of Montana, Vol. 10, No. 4 (Autumn 1972), p. 26.

FIGURE 1

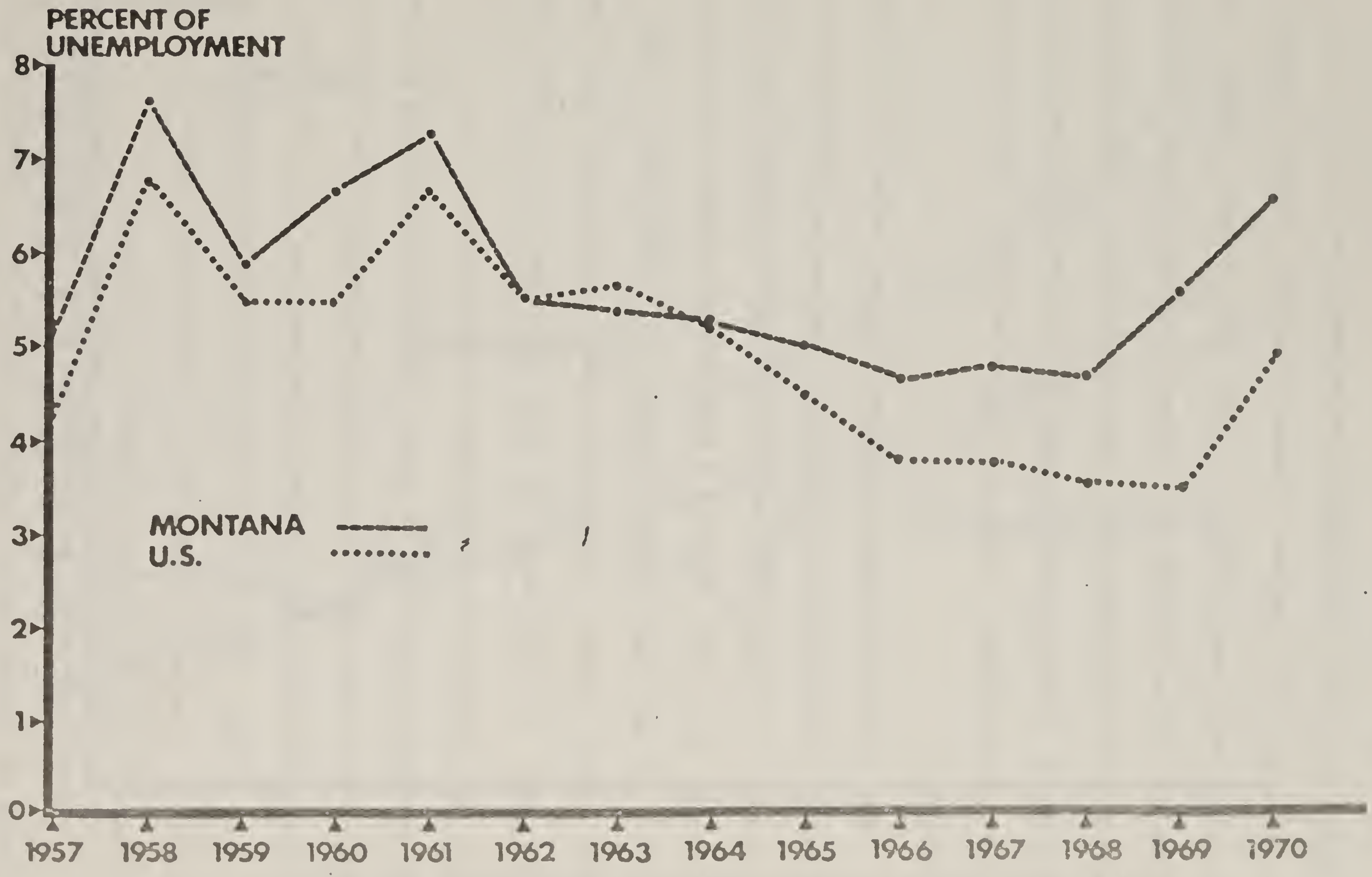
TOTAL EMPLOYMENT, MONTANA AND THE UNITED STATES, 1957–1970



SOURCE Montana Department of Labor and Industry. Employment Security Division and U.S. Department of Labor. *1974 Manpower Report of the President*

FIGURE 2

UNEMPLOYMENT RATES, MONTANA AND THE UNITED STATES, 1957–1970



SOURCE: U.S. Department of Labor, *Manpower Report of the President*, 1970 and 1974.

opportunities were more plentiful elsewhere in the nation.

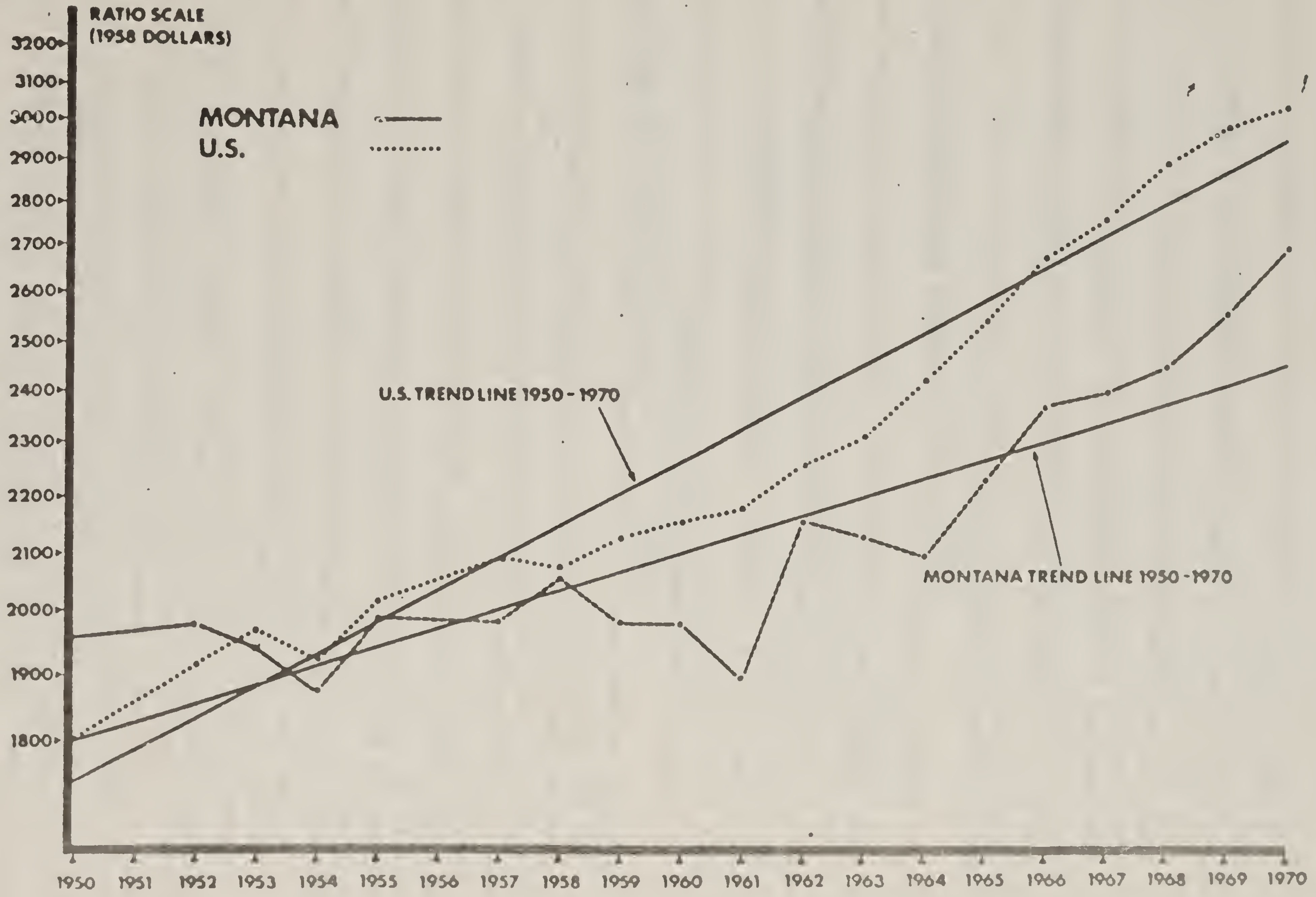
Employment figures provide a good overall perspective of growth in an economy, but they do not measure the economic well-being of the residents--that is, how "well-off" they are. There is no truly accurate measure of well-being. The most widely used indicator is per capita personal income, aggregate money income divided by population. The major shortcoming of this index is that it equates well-being with money income and certainly Montanans enjoy considerable benefits which are not easily measured in terms of dollars. Per capita personal income, nevertheless, is the one measure which is readily available and easily understood.

The trends in per capita personal income, converted to 1958 dollars to eliminate the effect of inflation, for Montana and the United States are shown in figure 3. During 1950, per capita income in Montana was $1.957; by 1970 it had risen to $2,710. This is a significant increase and indicates that the average Montanan was certainly better off in 1970 than in 1950. During the same period, however, per capita income in the United States rose from $1,805 to $3,067. In other words, in 1950 the income of the average Montanan was over 8 percent greater than the average for the nation. But by 1970 this figure had dropped to more than 12 percent below the nationwide average. Although the year-to-year data show numerous peaks and troughs, the overall trend is unmistakable: per capita income in Montana grew at a much slower rate than in the United States. This suggests that while Montanans were improving their economic position, they were not sharing in the national prosperity to the same degree as were their counterparts elsewhere in the country.

These figures may be interpreted in an entirely different manner. Some people may argue that the relative decline in per capita income indicates that Montanans are substituting non-monetary and psychic rewards for money income. Further, the argument continues, if these aspects could be included in per

FIGURE 3

PER CAPITA PERSONAL INCOME
MONTANA AND THE UNITED STATES, 1950-1970



SOURCE U S Department of Commerce, *Survey of Current Business*, August 1973 capita income, Montanan's well-being would be just as great, or possibly greater, than the average for the nation. This argument does have an element of truth; I stated earlier that per capita income does not include non-money benefits. However, several detailed studies of the reasons behind the low incomes concluded that most of the difference between the figures for Montana and the U.S. could be attributed to the following factors:[2]

1) Montana has a lower proportion of the population at work. The decades of net outmigration have depleted the ranks of the young and ablebodied leaving proportionately more of the very young and very old.

2) A "perverse industry-mix." This simply means that Montana has a greater than proportionate share of its jobs in industries which have low pay. For example, well-paying manufacturing jobs represented 25 percent of the total in the U.S., but only 9.7 percent in Montana during 1970.

3) A higher unemployment rate in Montana.

The study of Montana college graduates found that only 36 percent of those living outside the state and desiring to return would accept a cut in pay.[3] The remaining 64 percent stated they would require equal or higher incomes. This is admittedly only a small group, but they are persons who have lived in Montana and presumably know the full benefits. Yet, only about 1/3 thought they would receive sufficient non-monetary benefits to make up for lower incomes.

I am not trying to prove that residents receive no psychic income from living in Montana. Rather, I am simply stating that the evidence suggests that a significant portion of the income differences may be due to factors not related to the preferences of individuals and that non-money benefits--while they certainly exist--are probably not sufficient to counterbalance the lower levels of per capita income. Thus, it appears safe to conclude that the well-being of Montanans declined relative to the rest of the nation between 1950 and 1970.

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[2] Abstracted from the following citations: Montana Economic Study, Bureau of Business and Economic Research, University of Montana, Missoula, 1970, Vol. 3, Chapter 3. Paul E. Polzin, Structural Determinants of Wage and Income Levels in Montana, a staff study of the Montana Economic Study, Bureau of Business and Economic Research, University of Montana, 1970. The analysis in these reports was duplicated using more recent information.

[3] Paul E. Polzin, A Survey of Montana College Graduates, p. 34.

The data for employment, unemployment, and per capita income each represents a different facet of Montana's economy and may be subject to varying interpretations. But, taken together they point a very dismal picture of Montana's economic performance between 1950 and 1970.

The next step is to try and explain why Montana did so poorly. A thorough discussion would require more time than we can spare and I would refer interested persons to the Montana Economic Study. A brief summary of the major conclusions, however, helps to identify the problem areas and will aid interpreting current conditions and the projections of the future.

Montana's economy can be conceptually divided into primary and derivative industries. Primary industries are those which depend heavily on markets outside the state or are otherwise influenced by factors originating beyond Montana's borders. The major examples are agriculture, mining, manufacturing, railroads, and the federal government. Derivative industries, on the other hand, primarily serve the local population and include such businesses as wholesale and retail trade, the services, and state and local government. Economists believe that most economic growth occurring in relatively small areas, such as states, can be attributed to events outside the region under study and that changes in the derivative industries can be traced to changes in primary industries.

Table 1.5 presents Montana employment in primary and derivative industries during 1950, 1960, and 1970. It takes only a quick glance at these figures to

Table 1.5

Civilian Employment in Montana, 1950-70

Industry	Civilian Employment (Thousands) 1950	1960	1970	Change in Employment (Thousands) 1950-60	1960-70
Primary industries	103.3	86.6[a]	85.1	-16.7[a]	-1.5[a]
Agriculture	52.8	39.2	36.1	-13.6	-3.1
Mining	10.2	7.9[a]	6.6	-2.3[a]	-1.3[a]
Metal mining	7.8	5.0[a]	4.0	-2.8[a]	-1.0[a]
Coal mining, oil and gas extraction, and non-metallic mining	2.4	2.9	2.6	0.5	-0.3
Manufacturing	18.0	20.6[a]	23.9	2.6[a]	3.3[a]
Food and kindred products	4.2	4.3	4.3	0.1	0.0
Lumber and wood products	5.4	7.3	8.2	1.9	0.9
Primary metals refining	4.0	4.0[a]	4.7	0.0[a]	0.7[a]
Other manufacturing	4.4	5.0	6.7	0.6	1.7
Railroads	14.0	9.0	6.6	-5.0	-2.4
Federal government	8.3	9.9	11.9	1.6	2.0
Derivative industries	125.2	150.3	180.6	25.1	30.3
Nonrail transportation, communications, and utilities	7.9	10.0	10.8	2.1	0.8
Contract construction	10.5	11.0	11.0	0.5	0.0
Wholesale and retail trade	36.7	40.5	48.1	3.8	7.6
Services and finance	23.4	30.0	41.8	6.6	11.8
State and local government	20.0	28.6	40.7	8.6	12.1
All other employment	26.7	30.2	28.2	3.5	-2.0
Total employment	228.5	236.9[a]	265.7	8.4[a]	28.8[a]

Table 1.5 - (continued)

Sources: University of Montana, Bureau of Business and Economic Research, *Research Report of the Montana Economic Study*, pt. 1, vol. 2, chap. 2, table 2.4; and Montana Department of Labor and Industry, Employment Security Division, *Montana Employment and Labor Force*, Table C (revised March 1974). Percentages derived.

Notes: The data have not been adjusted for residence and multiple job holders. Percentage detail may not add to totals because of rounding.

[a] Adjusted to eliminate effects of strike.

determine why Montana's economy has been so lackluster: there has been little or no growth in jobs in the primary industries. Between 1950 and 1970, primary employment declined by over 18,000 workers. This decrease was more pronounced between 1950 and 1960, when almost 17,000 primary jobs were lost, than during the sixties, when a much more moderate decrease of 1,500 jobs occurred. The major factor causing the declines in primary employment was agriculture; the number of workers on Montana's farms and ranches dropped from almost 53,000 in 1950, to 39,000 in 1960 and then to 36,000 in 1970. For the most part, this resulted from the consolidation of farm and ranch units and reflects long-run agricultural trends occurring in Montana and throughout the nation. Agriculture, however, is not the whole story; there were also significant declines in the number of workers in mining and railroads--totalling 11,000 over the twenty-year period.

On the bright side, there were increases in wood products and in federal government employment; between 1950 and 1970, the former grew by almost 3,000 workers and the latter by 3,600 workers. But the growth of these industries, plus the addition of about 3,000 jobs in other industries, was not sufficient to counterbalance the declines in agriculture, mining, and railroads.

The relationships between primary and derivative industries are subtle and complex. In some cases, a direct connection between primary and derivative jobs may be established and employment multipliers may be estimated. But, over a period as long as a decade, many other changes take place which also affect employment relationships. Growing affluence, for instance, creates an increased demand for both private and public services; employment figures in those industries reflect this increase. Thus, the expansion in derivative employment shown in table 1.5 does not conflict with the decreases in primary employment. Notice, however, that the growth in derivative employment in the fifties was smaller than in the sixties. This correlates with the overall trend in primary employment, which declined more during the former than the latter period.

It is interesting to note that the largest increases in employment were in the trade, services, and state and local government. These industries are relatively low paying and are examples of jobs which led to the "perverse industry-mix" mentioned earlier as one of the causes of Montana's lagging growth in per capita income.

In summary, Montana's population grew at a rate far below the national average between 1950 and 1970 due, primarily, to net outmigration. I believe the major determinant of this net flow of people was an insufficient number of new jobs was created. Also, the average level of economic well-being, as measured by per capita income, failed to keep pace with the increases experienced elsewhere in the nation. This slow economic growth may, in turn, be traced to the poor performance of Montana's primary industries.

II

1970 to the Present: Only Apparent Differences

The previous section traced the dismal performance of Montana's economy between 1950 and 1970. But, this is history. It is now five years later and conditions may have changed; the conclusions concerning the fifties and sixties may no longer be relevent half-way through the seventies. The following pages present updated information and attempts to assess whether or not there has been any alterations in the underlying economic trends.

Analyzing current economic conditions, especially at the state level, is fraught with danger because of the paucity of up-to-date and accurate numbers. Economic data are notoriously behind the times. Information for 1973 and 1974 is just now being released and it will be two more years before complete 1975 figures are available. Moreover, even if the data were complete, the time period is too short to put things in perspective. The underlying trends identified in figures 1 to 3 were noticeable only when viewed over a long period. Finally, there is the current recession, whose full implications for the national economy are not yet known.

Figure 4 presents the data for population, employment and per capita income in Montana since 1970. According to preliminary estimates, Montana's population was 735,000 on July 1, 1974, up from about 694,000 in 1970.[1] These population figures should be taken with a grain of salt because they are only estimates and are not as reliable as the actual counts provided by the census. Total employment increased moderately from 1970 to 1971. Then, beginning in 1972, it turned sharply upward. Similarly, per capita (in 1958 dollars) income increased rapidly until 1973. It then decreased significantly during 1974.

Taken together, these figures seem to indicate that Montana's economy has not performed badly since 1970; population, employment, and per capita income (even allowing for the 1974 decline) are all exceeding their historical trends. There is contradictory evidence, however, and I would be hesitant to conclude that Montana's has turned a corner and broken the trend of slow growth.

Table 2.1 presents a detailed picture of the 1970-1974 change in employment. These figures show a slight increase in primary employment, from 85,100 in 1970 to 86,200 in 1974. This apparent growth should be interpreted with caution for a number of reasons. First of all, I am skeptical of the figures for agriculture, which show a decline of only 1,000 workers. While they seem to indicate a more moderate decline than experienced during the fifties and sixties, agricultural employment is very difficult to estimate and these figures may be the most unreliable of all the numbers reported in table 2.1. Given the estimating methods, a change of 1,000 out of 36,000 should not be taken too seriously. The safest interpretation is that between 1970 and 1974 people did not leave farms

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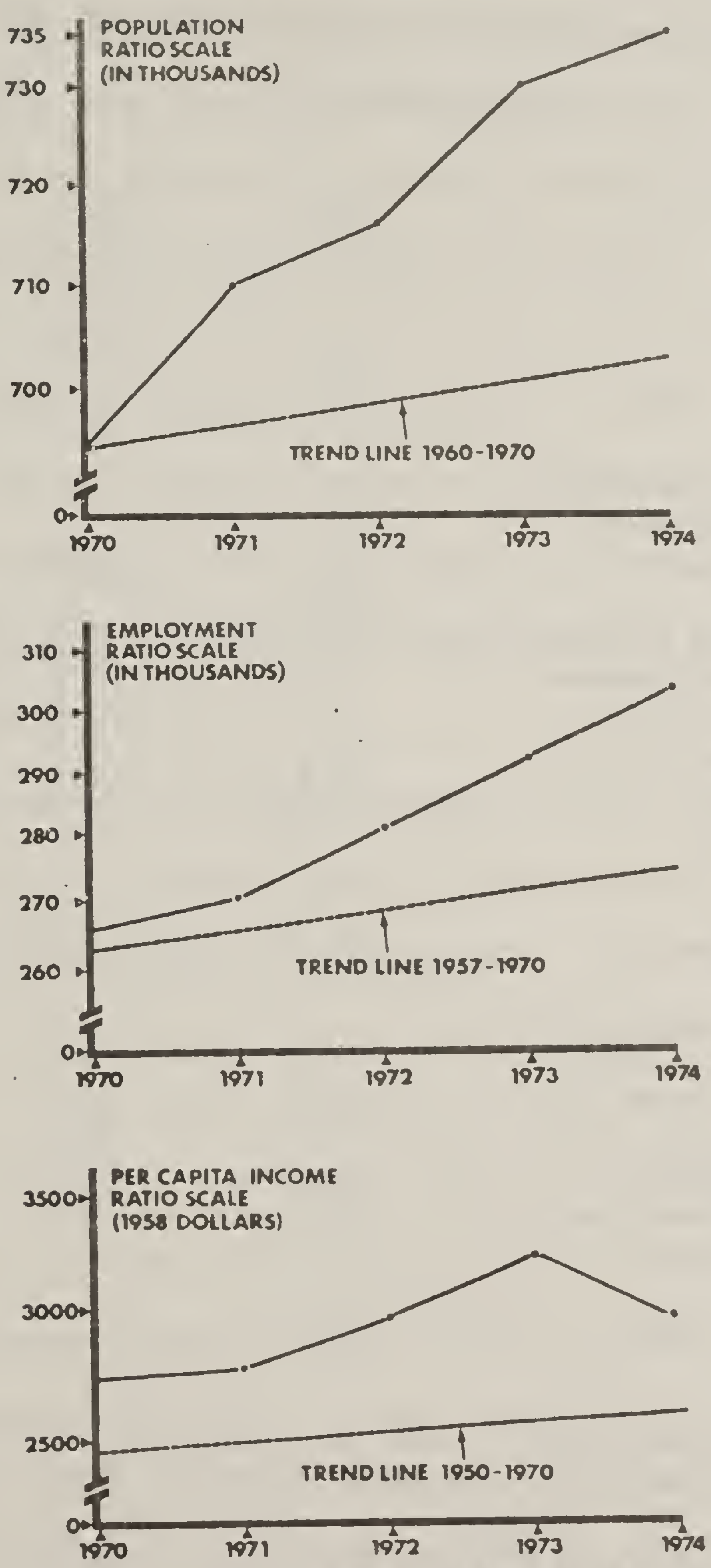
[1] U.S. Bureau of the Census, Population Estimates, Series P26, No. 109, 1975, p. 3.

FIGURE 4

MONTANA'S POPULATION, EMPLOYMENT AND INCOME SINCE 1970



SOURCES U S Bureau of the Census, Montana Department of Labor and Industry, Employment Security Division, U S Department of Commerce, Bureau of Economic Analysis

¯able 2.1

Civilian Employment in Montana, 1970 and 1974

(In Thousands)

	1970	1974	Change 1970-74
Primary industries	85.1	86.2	1.1
Agriculture	36.1	35.1	-1.0
Mining	6.6	7.4	0.8
Metal mining	4.0	4.1	0.1
Coal mining, oil and gas extraction and nonmetallic mining	2.6	3.3	0.7
Manufacturing	23.9	24.5	0.6
Food and kindred products	4.3	4.0	-0.3
Lumber and wood products	8.2	9.3	1.1
Primary metal refining	4.7	3.4	-1.3
Other manufacturing	6.7	7.8	1.1
Railroads	6.6	6.5	-0.1
Federal government	11.9	12.7	0.8
Derivative industries	180.6	215.3	34.7
Nonrail transportation, communications, utilities	10.8	13.0	2.2
Contract construction	11.0	12.8	1.8
Wholesale and retail trade	48.1	59.5	11.4
Services and finance	41.8	54.1	12.3
State and local government	40.7	45.2	4.5
All other employment	28.2	30.7	2.5
Total employment	265.7	301.5	36.8

Source: Montana Department of Labor and Industry, Employment Security Division, *Montana Employment and Labor Force* and unpublished data.

Note: These data have not been adjusted for residence and multiple job holders.

and ranches as fast as during previous periods. Some departures may have been only temporarily postponed due to the recent prosperity in agriculture.

The largest number of new jobs (1,100) was provided by the wood products industry. But 1970 is not a good year for comparison purposes; it was not a good year for the forest industries. If the 1974 figure is compared to employment in 1968 and 1969, the increase is less than 500 jobs. Significant layoffs in wood products did not begin until November and December; they reduced the annual average employment for 1974 by about 100 workers.

Primary metal refining, another of Montana's major manufacturing activities, employed 1,300 fewer workers in 1974 than in 1970. Much of this loss occurred in Great Falls, with the closure of the Anaconda plant. Most of the growth in mining employment (about 600 workers) occurred in the eastern Montana coalfields. Much of this gain may be cancelled by the loss of jobs in Butte's underground mines.

Primary employment did increase between 1970 and 1974, but just barely. A slight downward revision in the estimate of agricultural employment, however, could change the reported growth into a decline. The data is not yet available to fully evaluate the effect of the recession. But, as is shown later, it is doubtful whether it had a significant effect on the 1974 figures.

The greatest increase in employment, about 34,700 workers, occurred in the derivative industries. These jobs are, of course, important to Montana and provide needed employment opportunities for many persons. But, I believe this growth should be interpreted with caution; it may not represent a sustainable trend. In the first place, a disproportionate share of the increase in derivative jobs may be directly or indirectly associated with the recent prosperity in agriculture. Whether or not this prosperity--already limited to crop producers--will continue is open to question.

Many new jobs in the derivative industries may simply represent an increase in the number of Montanans willing to work; a rise in the labor force participation ratio. There has been a revolution in the working habits of women. More and more females have entered the labor force and many have taken jobs in the trades and services, the industries which have shown the greatest growth in employment. Many of these jobs may be seasonal, part-time, or low paying. The actual increase might be more moderate if employment could be converted to full-time equivalent (FTE) positions.

I am not saying the 1970-74 increases in employment are illusionary. Nor do I believe the increases in derivative employment contradict the slow growth in the primary industries. (The relationship between primary and derivative industries is not that precise; both the fifties and sixties saw rising derivative employment accompanying declines in primary industries.) But, aside from coal mining, conditions in the primary industries do not appear to have changed from the sixties and the remarkable growth in the derivative industries may have been accentuated by some unusual conditions.

The population data shown in figure 4 are simply estimates and are not as reliable as the actual counts of persons provided by the Census of Population. These estimates are prepared by the Census Bureau which uses a standardized methodology for all states. This procedure may work well for large urban states, but there is some doubt about their accuracy for Montana. For example, the annual intercensal population estimates for Montana during the sixties show a rapid growth rate and relatively less net outmigration during the early part and actual declines and accelerated net outmigration near the end of the decade.[2] This appears contrary to trends in other economic data; specifically, figure 1 shows the greatest rise in employment opportunities during the latter portion of the decade. There may be something inherent in the Census Bureau's methodology as applied to Montana which tends to overstate population growth immediately after the dicennial census, with corresponding understatments later in the period. In short, there is a possibility that the estimates in figure 4 may overestimate the increase in Montana's population since 1970.

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[2] U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 460, 1971, p. 8. __________, Current Population Reports, Series P-25, No. 348, 1966, p. 10.

The sharp upward trend in per capita income shown in figure 4 can be traced to the prosperity in agriculture; Montana farm income increased by 78 percent (in constant dollars) while nonfarm income declined by 15 percent (in constant dollars) between 1970 and 1973.[3] Correspondingly, preliminary data suggest the 1973-74 decrease in real per capita income was due mainly to the declining fortunes of agriculture.[4] Thus, the apparent increase, and subsequent decline, in Montana's per capita income since 1970 was due almost entirely to the vacillating conditions on farms and ranches. It does not represent increased well-being for all Montanans.

What about the recession? Couldn't the current downturn in the national and world economy bias some of the data to make things appear worse than they actually are? This is certainly a possibility and cannot be ruled out. Unfortunately, there is simply not sufficient up-to-date information to make a definite judgment. I would feel much more comfortable talking about the effects of the recession in a year or so, when the whole experience can be put in perspecitive. There is, however, some evidence which suggests that current economic conditions will not alter the previous analysis.

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[3] U.S. Department of Commerce, Survey of Current Business, Vol. 53, No. 8 (August 1973), p. 48. __________, Survey of Current Business, Vol. 54, No. 8 (August 1974), p. 42.

[4] U.S. Department of Commerce News Release, "1974 State Personal Income," BEA 75-30, May 1975, table 6.

A recent study by the U.S. Department of Commerce examined the cyclical sensitivity of states and concluded that Montana ranked 48th out of the 50 states.[5] In other words, the cyclical effects on Montana's economy was one of the smallest of all the states. This may seem improbable, especially in light of the "boom and bust" history of the state, and requires further explanation. This conclusion does not mean there are no economic ups and downs in Montana. Rather, our cyclical swings are not related to the national business cycle. It was shown that the rise and fall in per capita income between 1970 and 1974 was due mainly to agricultural conditions. In fact, looking back at figure 3, almost all of the peaks and troughs between 1950 and 1970 correlated with development on farms and ranches. It appears to be only a statistical accident that the present swing in agriculture coincides with a national business cycle.

Among Montana's primary industries, only wood products and metal mining and refining are distinctly cyclical. These industries represent about 1/5 of total primary employment (see table 2.1). Also, these jobs are not spread across the state, but are concentrated primarily near Butte and elsewhere in western Montana. Thus, most of the effects of the national business cycle are probably limited to these regions. Viewed in light of these facts, the conclusion of the study cited earlier do not appear unreasonable.

There is currently considerable debate among economists concerning the exact beginning of the recession. I do not know what they will conclude; but, from the fragmentary data now available, it appears that significant effects on Montana's economy were not felt until very late in 1974 or even early 1975. Figure 5 presents the monthly unemployment rates (seasonally adjusted) for

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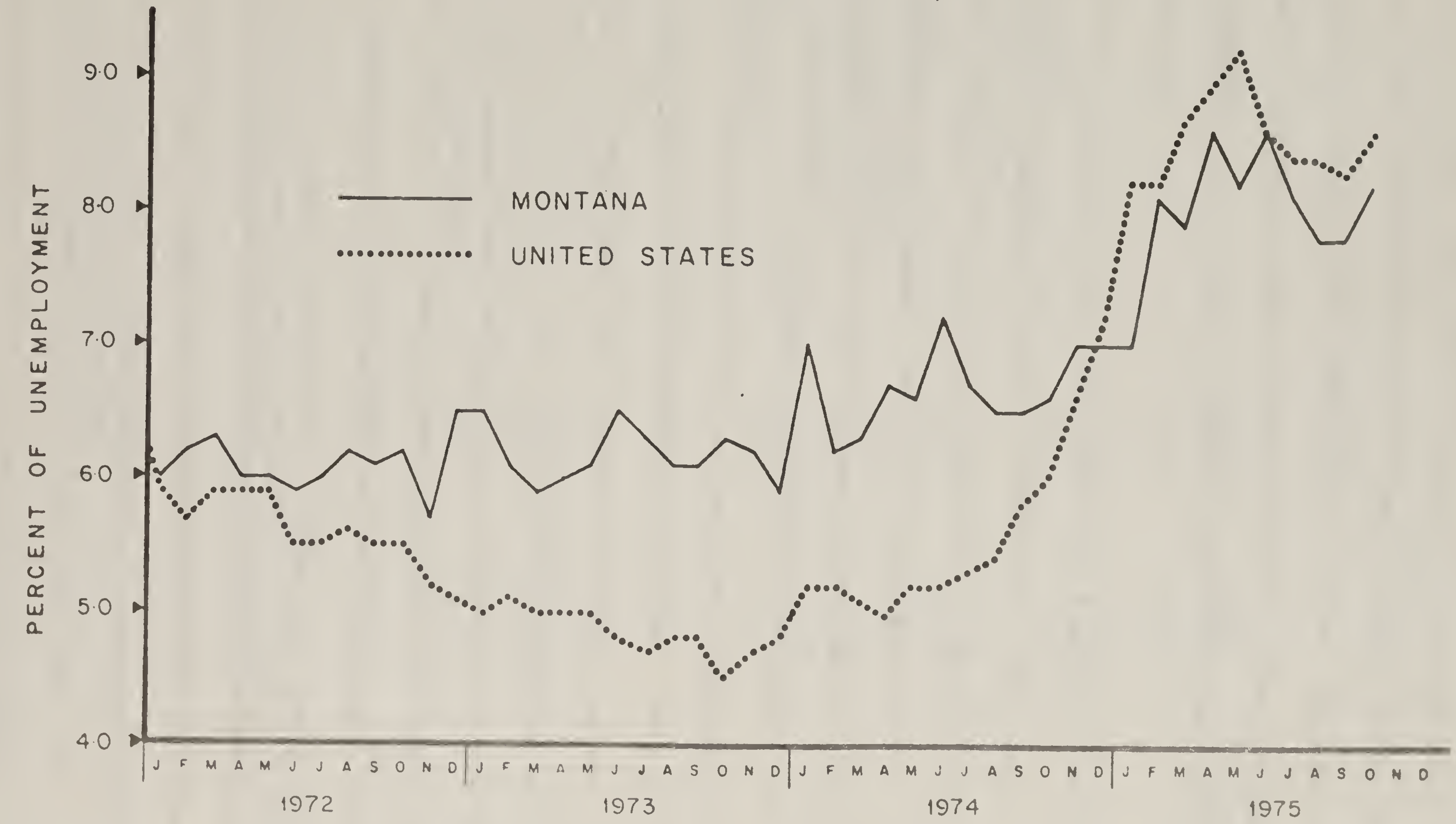
[5] Robert B. Bretzfelder, "Sensitivity of State and Regional Income to National Business Cycles," Survey of Current Business, Volume 53, No. 4 (April 1973), pp. 22-34.

FIGURE 5

UNEMPLOYMENT RATES, MONTANA AND THE UNITED STATES, 1972 - 1975

(SEASONALLY ADJUSTED)



SOURCE: Montana Department of Labor and Industry
Montana Employment and Labor Force, March 1972 and July 1975

Montana and the United States from January 1974 to October 1975. Notice that the graph for the U.S. turned upward about the middle of 1974 and then accelerated toward the end of the year and into 1975. Montana, on the other hand, experienced only a slight increase during the last half of 1974, with significant increases after the first of the year. This suggests that the impact of the national business cycle on the Montana labor market did not begin until the end of the year and the annual averages for 1974 are probably not seriously biased.

The data in figure 5 also shows that, with the exception of recent months, Montana's unemployment has remained consistently above the national average. This is a continuation of the trends reported earlier for the fifties and sixties. Since the beginning of the year, however, the unemployment rate in Montana has been below the nationwide figure; but, only because of the unusually high unemployment elsewhere in the nation.

I have repeatedly cautioned against placing too much credence on the data for only one year. But, just to have some idea of current conditions in Montana's economy, employment data for the first ten months of 1975 are compared to the corresponding portion of 1974 in table 2.2. In the primary industries, we see that agricultural employment declined by about 1,500 workers, a greater annual rate than experienced between 1970 and 1974. This may reflect the renewed departure of persons from Montana farms and ranches, or it may be simply due to the rough manner in which these figures are estimated. Events in the Butte area were primarily responsible for the declines in metal mining while there were corresponding increases in coal mining. It is interesting to note that average employment in the wood products industry decreased by only 300 workers. This signifcantly understates the impact of the recession on this industry; average employment does not reflect the decreased working hours and these figures exclude the Hoerner-Waldorf mill. Among the derivative industries,

Table 2.2

Civilian Employment in Montana, 1974 and 1975

(In Thousands)

Industry	1974[a]	1975[a]	Change 1974-1975
Primary industries	87.6	85.3	-2.3
Agriculture	36.5	35.0	-1.5
Mining	7.4	7.2	-.2
Metal mining	4.2	3.3	-.9
Coal mining, oil and gas extraction and nonmetallic mining	3.2	3.9	.7
Manufacturing	24.5	23.7	-.8
Food and kindred products	4.0	3.7	-.3
Lumber and wood products	9.4	9.1	-.3
Primary metal refining	3.4	3.3	-.1
Other manufacturing	7.7	7.6	-.1
Railroads	6.4	6.2	-.2
Federal government	12.8	13.2	.4
Derivative industries	214.9	223.5	8.6
Nonrail transportation, communications, utilities	13.1	12.9	-.2
Contract construction	13.0	11.7	-1.3
Wholesale and retail trade	59.3	61.6	2.3
Services and finance	54.0	56.6	2.6
State and local government	44.5	49.4	4.9
All other employment	31.0	31.3	.3
Total employment	302.5	308.8	6.3

Source: Montana Department of Labor and Industry, Employment Security Division, *Montana Employment and Labor Force* and unpublished data.

Note: These data have not been adjusted for residence and multiple job holders.

[a] Average for first ten months of the year.

the largest increase was almost 5,000 workers in state and local governments; most of these new jobs were with local governments and may have been due to CETA and other federally financed programs. Total employment grew by about 6,300 workers during the last year as compared to an average annual increase of about 9,400 workers between 1970 and 1974.

In summary, current economic data shows that Montana may have experienced relative prosperity since 1970. Definite conclusions cannot be made until more information is available; but, further analysis suggests that this may not be a sustainable trend and that the underlying conditions behind Montana's slow growth in the fifties and sixties have not been altered. Except for coal mining, Montana's primary industries--the economic base of the state--have not changed. The rapid increase in derivative jobs may have been due to some unusual circumstances. Finally, much of the apparent prosperity may be directly or indirectly caused by agriculture, whose fortunes may change dramatically from one year to the next.

III

Projections of the Future

The reputation of economists has suffered in recent years due to their apparent inability to anticipate future economic trends. Time and time again newspapers quote respected economists stating something is certain to happen--for example, "there will be no recession," "inflation is coming to an end,"--only to have them contradicted by the actual events. This track-record seriously impairs the credibility of economists and throws doubt on the usefulness of examining future trends in Montana's economy.

To a large extent, the loss of faith in economists is due to a misunderstanding by the public of economic projections, one of the basic tools of economic analysis. Also, some of the blame must be placed on economists who make off-the-cuff remarks without precisely defining their statements.

Economic projections consist of two essential parts, the underlying assumptions and the conclusion. Essentially, they may be viewed as "if-then" statements. One example of a projection is "if the interest rate falls (the assumption) then home building will increase (the conclusion)," or "if the price of copper rises (the assumption) then Anaconda will hire more workers (the conclusion)." The important point is that a projection does not, by itself, say anything about the likelihood of the event. In the previous example, the assumption states "if the interest rates fall;" it does not imply that a drop in the interest rate will occur. It is legitimate to use projections to analyze unlikely events. For example, "if oil prices return to their previous level then the upward pressure on the consumer price index will be eased" is a valid projection even though it is improbable. Thus, the user of a projection must keep the underlying assumptions firmly in mind and the economist should specifically outline the assumptions he has made.

If an economist believes his assumptions are realistic--that is, he thinks they are likely to occur--then he may use his projection as a prediction of future events. Technically, these are called forecasts. The basic difference between projections and forecasts is that the latter includes, sometimes implicitly, an assessment of the realism of the assumption. If a number of alternative assumptions seem equally probable, the economist may choose to make a series of projections, with one projection corresponding to each assumption. A good example of this procedure will be shown later when the future population of Montana is discussed.

All of this may appear unnecessarily complicated to the layman who only wants a rough idea of future economic trends; he must first ferret out the underlying assumptions and then evaluate their realism. But, the real world--especially the world of economics--is not simple or easy to generalize. Economic projections are a very powerful and useful analytical device. They must, however, be used carefully because they may be easily misinterpreted.

The compexities of the assumptions underlying projections are, in fact, one of the strong points of this analytical method. For example, a projection need not be rejected simply because one or two of the assumptions are deemed inappropriate. Rather, these assumptions may be modified and a new projection derived with only a minimum expenditure of time and effort. This feature will be utilized when we examine the projections for Montana.

This lengthly discourse concerning the logic behind economic projections and their correct interpretation is not mere nitpicking. The following pages present projections which have some very important implications for Montana's economy. It is crucial that the rules are carefully spelled out in advance so there will be no confusion or misinterpretation of the findings or the underlying motivations.

Four sets of projections for Montana's population and employment during 1980 and 1985 are presented in table 3.1. Before discussing them in detail, some information concerning their background and origin is presented.

OBERS is an acronym for the Office of Business Economics (now the Bureau of Economic Analysis) of the U.S. Department of Commerce and the Economic Research Service of the U.S. Department of Agriculture, the two federal agencies which were primarily responsible for their derivation. OBERS provides a series of coordinated projections for the nation, all states, and selected multicounty regions, computed with alternative assumptions and standardized methodologies. Its projections have been widely accepted by var ous government agencies and private users. Essentially, the OBERS projections are extrapolation of trends as they existed during the late sixties and early seventies, supplemented with certain key assumptions.

The NPA projections are prepared by the National Planning Association of

Table 3.1

Alternative Projections of Population and Employment, Montana 1980 and 1985

	1970 (Actual)	1980	1985
		Population	
OBERS "C"	694,409	720,000	NA
OBERS "E"	694,409	669,700	667,100
Montana Economic Study	694,409	725,000	NA
NPA	694,409	NA	NA
		Employment	
OBERS "C"	254,088	262,500	NA
OBERS "E"	254,088	269,700	270,300
Montana Economic Study[a]	254,088	277,600	NA
NPA[a]	254,088	304,200	319,600

Sources: [1970] U.S. Bureau of the Census, Census of the Population: 1970, Vol. 1, *Characteristics of the Population,* Part 28, Montana, U.S. Government Printing Office, Washington, D.C., tables 16 and 53. Employment includes persons 14 years old and older. [OBERS "C"] *1972 OBERS Projections, Series "C"*, U.S. Water Resources Council, Washington, D.C., 1972, Vol. 5, pp. 112-115. [OBERS "E"] *1972 OBERS Projections, Series "E"*, U.S. Water Resources Council, Washington, D.C., 1974, Vol. 4, pp. 82-84. [NPA] Joe Won Lee and William B.D. Hong, *Regional Economic Projections: 1960-1985*, Washington, D.C., National Planning Association, 1973, Report Number 73-R-1, p. 563. [Montana Economic Study] *Research Report of the Montana Economic Study*, Bureau of Business and Economic Research, University of Montana, Missoula, 1970, Vol. 2, Chapter 4, p. 4.14.

NA = not available.

[a] Adjusted to be comparable with OBERS.

Washington, D.C. They are similar to OBERS in that they consist of a coordinated set of projections for the nation and all states. The major difference between the NPA and OBERS is in certain assumptions about the national economy--for example, in the change in labor productivity and possible federal tax reforms--and in the manner in which economic growth is distributed among the various geographic areas.

The Montana Economic Study was conducted by the Bureau of Business and Economic Research at the University of Montana in Missoula. It has been widely accepted and quoted in Montana.

There are advantages and disadvantages to each set of projections. Both OBERS and NPA view the various geographic regions as interdependent, events in one area of the country are taken into account in the projections for other regions. On the negative side, the use of a single projection methodology implies that unique aspects of individual states or regions cannot be easily incorporated. The projections of the Montana Economic Study were derived within the framework of national projections but were not integrated with projections for other areas or states. These are the only projections done by Montanans and tailored to the state's economy.

Looking first at population, the upper portion of table 3.1 presents three projections for Montana. (The National Planning Association does not publish population projections for states.) It takes only a quick glance at these figures to see significant differences. OBERS "C" and the Montana Economic Study project a population of 720-725,000 in 1980. The OBERS "E" projections, however, are more than 50,000 lower, at 669,700 residents in 1980. This provides a dramatic example of the effect of differences in the underlying assumptions. The two OBERS projections are essentially identical except for the birth rates.[1] The "E" series takes account of recent events and assumes a rapid decrease in births toward the net reproduction rate; the fact that they show a decline from the 1970 level of population has received much publicity. The "C" series uses a much higher birth rate, approximating the experiences during much of the sixties. The Montana Economic Study did not make explicit assumptions about birth rates. The effect of its methodology was to extrolate the trends of the sixties, which results in its figures approximating series "E."

The dissimilarity between these projections is simply due to the differences in the number of births between 1970 and 1980. Demographers and other social scientists are not certain if current events represent a change in the long-run trend. Some argue that the low birth rates will continue, while others predict a return to a higher number of births. This difference of opinion provides a good example of projections using alternative assumptions. Rather than attempting to predict whether higher or lower birth rates are more likely, two sets of projections were made. The user may then decide, provided he knows the underlying assumptions, which he prefers.

Population projections are fascinating and interesting; indeed, they are often considered newsworthy and receive considerable public attention. But, as was just shown, a change in one assumption can make a significant difference. Further, in the medium long-run--10 or 15 years in the future--population projections really say very little concerning the economic health of an area. Those born in 1970 will not be looking for work before 1987, or even later. Employment projections, on the other hand, reflect the ability of a region to provide jobs for its residents and are often interpreted as a barometer of overall economic conditions; the four sets of figures for Montana are shown in the lower portion of table 3.1.

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[1] There are a few other minor differences, dealing mostly with assumptions concerning changes in the national economy. See 1972 OBERS Projections Series "E", U.S. Water Resources Council, Washington, D.C., 1974, Vol. I, p. iii.

Before examining the implications in detail, I would like to discuss the two OBERS projections. The "C" series projects 1980 employment to be 262,500 while the corresponding figure in the "E" series is 269,700, a difference of about 7,000 workers. These two values are in sharp contrast to the population projections, which differed by 50,000. Notice, also, that the "E" employment projection is slightly larger. This is an example of the possible misconceptions which can be obtained by looking only at population projections. Specifically, series "E" projects more jobs for Montanans despite the declining population.

It requires only a quick glance at the four employment projections to detect significant differences between them.[2] The two OBERS projections are the lowest, with values of 262-269,700 for 1980 and 270,300 for 1985; the NPA projections, 304,200 in 1980 and 319,600 in 1985, are the highest; and the Montana Economic Study, 277,600 in 1980 falls in between. A detailed examination revealed that these projections were based on dissimilar assumptions: if they are standardized, the differences are greatly reduced.

The OBERS projections are based on trends as they existed in the 1960's and very early 1970's. This period provides an acceptable foundation for projections because, with one major exception, conditions in Montana have not changed significantly in the last five years. The exception is, of course, coal development; the OBERS projections do not include the employment directly and indirectly associated with increased extraction and processing of Montana coal. If these workers are added to OBERS, the resulting employment projections more accurately reflect trends as they currently exist.[3]

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[2] The figures in table 3.1 have been adjusted so they are comparable because the published projections used different definitions of employment. This involved converting the Montana Economic Study and NPA projections to the U.S. Bureau of the Census' concept of employment used by OBERS. Essentially, this eliminates the double counting due to multiple job holders and the use of an April reporting date. The employment figures in table 3.1 are not comparable to those in previous sections.

A recent study concluded that coal development will directly and indirectly increase employment by 5,000 to 7,500 in 1980 and 6,000 to 10,600 in 1985.[4] If the higher figures are added to the OBERS "E" projections, the resulting values are 277,200 for 1980 and 280,900 in 1985. (Using OBERS "C" leads to a projection for total employment of 270,000 in 1980.)

The NPA projections, on the other hand, are probably too high. Specifically, their assumptions concerning employment in agriculture, wood products, and government appear somewhat optimistic in light of current events.

NPA projects that agricultural employment in Montana will grow from 26,800 in 1970 to 32,100 in 1985 and to 32,400 in 1985.[5] This represents a complete reversal of the 1950-1970 trend which saw agricultural employment decline by almost one-third. As shown earlier, employment on Montana's farms and ranches has more or less stabilized since 1970, but this may be only a short-run reaction to the recent prosperity in agriculture. The past trends toward increased mechanization and consolidation combined with the fact that the average age of Montana farm and ranch operators is 50 years, suggest that it is unlikely that farm employment will increase.[6] Taking an optimistic view and assuming farm employment stabilizes at its 1970 level, suggests that the NPA projections are about 6,000 employees too high in 1980 and 1985.

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[3] In fact, the OBERS projections were used in precisely this manner to estimate the potential impact of coal development. See Paul E. Polzin, Water Use and Coal Development in Eastern Montana, Bureau of Business and Economic Research, University of Montana, Missoula, 1974, pp. 114-126.

[4] Paul E. Polzin, Water Use and Coal Development in Eastern Montana, pp. 108-117. These figures have been adjusted to eliminate multiple job holders.

[5] Joe Won Lee and William B.D. Hong, Regional Economic Projections: 1960-1985, National Planning Association, Washington, D.C., Report number 73-R-1, 1973, p. 563.

Wood products employment in Montana is projected by NPA to grow from 9,100 in 1970 to 13,300 and 14,000 in 1980 and 1985. Future developments in this industry are difficult to evaluate because they depend on the business cycle, events in other wood producing regions, and the U.S. Forest Service. There is currently much debate concerning harvesting practices on Montana's forest land. Even though no definite conclusions have been reached, significant increases in timber removals on a sustained basis appear rather unlikely.[7] Further, some experts believe Montana may lose some of its competitive advantage to other timber growing regions in the U.S.--especially the South--and the harvesting of roundwood from Montana's forests may actually decline during the next 30 years.[8]

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[6] U.S. Bureau of the Census, Census of Agriculture, 1969, Volume 1, Area Reports, Part 38, Montana, Section 2, County Data, U.S. Government Printing Office, Washington, D.C., 1972, p. 1.

[7] Dennis L. Schweitzer, Robert E. Benson, and Richard J. McConne, A Descriptive Analysis of Montana's Forest Resources, USDA Forest Service Resource Bulletin INT-11, Intermountain Range and Experiment Station, Ogden, Utah, 1975, pp. 21-25.

[8] D.L. Holly, "Location of the Softwood Plywood and Lumber Industries," Land Economics, May 1970, pp. 127-137. 1972 OBERS Projection, Series "E", Vol. I, p. 106.

Taking the middle ground and assuming wood products employment will increase to about 11,000 suggests the NPA total employment figures are an additional 2,000 to 3,000 workers too high in 1980 and 1985, respectively.

The final area of disagreement, and the one with the greatest potential error, concerns NPA's projection of government employment. In 1970, NPA reported 53,500 persons in Montana working for the federal, state, and local governments. By 1980, it projects an increase to 77,300 and then a further rise to 86,600 in 1985. This growth is possible, but not very probable.[9] State and local government employment did increase at approximately the projected rate during part of the sixties. But, there is good reason to believe that future employment growth at all levels of government will be much more moderate. There is currently strong political pressure to hold down the increases of government costs. This surely will be reflected in more moderate growth in new employees. Further, much of state and local government employment is concerned with education and the rapid increase in this sector during the past decades was probably due to rapidly rising enrollments caused by the post-war baby boom. There has been a drop in birth rates and this should moderate the demands for additional facilities. If it is assumed that government employment in Montana grows at the rate experienced between 1970 and 1974 (see table 2.1) the revised figures would be about 66,000 in 1980 and 75,000 in 1985, about 11,000 and 12,000 below those projected by NPA.

It is difficult to determine the exact assumption NPA made concerning coal development in Montana. It does project coal mining employment to increase by

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[9] The excessively high rate of growth projected by NPA has been criticized elsewhere. See Research Report of the Montana Economic Study, Bureau of Business and Economic Research, University of Montana, Missoula, 1970, pp. 431-432.

800 workers between 1970 and 1980 and an additional 300 workers by 1985. This is approximately equal to the projections in a recent study.[10] Thus, it appears safe to assume that the NPA projections of total employment do include significant increases in coal related activities.

After changing the assumptions with respect to agriculture, wood products, and government, the NPA projections are about 23,000 and 27,000 workers too high in 1980 and 1985. These totals are slightly greater than the sum of the individual industry adjustment because agriculture, wood products, and the federal government are basic industries; altering their employment requires further changes in derivative employment. Subtracting these totals from those shown in table 3.1 leads to revised employment projections of 281,200 and 292,600 for 1980 and 1985, respectively.

The Montana Economic Study did not anticipate the magnitude of likely coal development.[11] On the other hand, it appears to have overestimated the decline in agriculture and was, perhaps, too optimistic about metal mining. These errors tend to counterbalance each other and reduce the discrepency in the projection for total employment.

After standardizing the assumptions, the four employment projections are remarkably close. The revised figures for OBERS Series "E" are 277,200 in 1980 and 280,900 in 1985. (The corresponding Series "C" projection for 1980 is 270,000.) The NPA projections are still higher, 285,200 in 1980 and 292,600 in 1985, but the differences between them and OBERS have been reduced. The Montana Economic Study, projecting 1980 employment at 277,600, still holds an intermediate position.

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[10] Paul E. Polzin, Water Use and Coal Development in Eastern Montana, pp. 108 and 11.

[11] Research Report of the Montana Economic Study, pp. 4.13-4.33.

Employment projections do not tell the whole story. They provide a rough idea of the number of jobs which will be available in Montana, but they say nothing about the number of persons available for work. The post-war baby crop has grown out of diapers and is entering the labor force in increasing numbers. Based on the 1970 Census, roughly 151,000 young Montanans will enter the prime employment age groups between 1970 and 1980. At the same time, only about 55,000 persons will reach retirement age. This phenomenon is often called the "natural increase" in the labor force and implies that Montana must have growing employment opportunities simply to provide jobs for those persons already living here.

A rough idea of the potential labor market pressures may be obtained by "aging" the 1970 population forward and applying projected participation rates to derive the expected number of persons in the labor force.[12] Since those born after 1970 would not normally be looking for jobs earlier than 1985, no assumptions are made concerning future trends in the birth rate. This procedure is not designed to accurately describe Montana's future labor force. By 1980 or 1985, many persons living in Montana during 1970 may have left; to some extent, they may be replaced by others with dissimilar characteristics. Rather, this method provides an indicator of the potential increase in the labor force due only to persons already living in Montana.

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[12] Age-sex participation rates for 1980 and 1985 have been projected in the following source: Denis F. Johnson, "The U.S. Labor Force: Projections to 1990," Monthly Labor Review. Volume 96, No. 7 (July 1973), pp. 3-14. Montana's participation rates have often been lower than the national average. Consequently, the published figures have been adjusted downward in light of the participation rates reported in U.S. Bureau of the Census, Census of Population: 1970, Detailed Characteristics, Final Report PC(1)-D28, Montana, U.S. Government Printing Office, Washington, D.C., 1972, table 164.

The potential labor force for 1980 and 1985 based on Montana's 1970 population is presented in the upper portion of table 3.2. These figures show the labor force growing from 268,800 in 1970 to 321,900 in 1980 and to 342,100 in 1985. This increase is due not only to a heavy concentration of young persons, but also to the projected changes in the participation of certain age-sex cohorts--for example, the increased propensity of women to look for jobs outside the home. Assuming a 6 percent unemployment rate, roughly equal to Montana's experience between 1970 and 1974, employed workers will number 302,600 in 1980 and 321,600 in 1985.

The potential labor force and the number of employed workers may be used to place the projections in proper perspective. The revised employment projections are presented in the center portion of table 3.2. They show, for example, that employment will be between 277,200 and 285,200 in 1985--ignoring the OBERS "C" projection because there is no corresponding value for 1985. On the other hand, there is the potential for 302,600 employed persons. This implies a "job gap"--an excess of persons available for work over the number of positions, even after allowing for 6 percent unemployment--of between 17,400 and 25,400. Similar calculations for 1985 suggest that the "job gap" will grow to between 29,000 to 40,700.

What do all these numbers mean? They sould not be interpreted as a prediction. In fact, they actually describe an impossible situation because modifying forces will have been at work long before 1980. Rather, they imply that the projected increase in the number of jobs, which include significant coal development, will fall far short of the number of Montanans who would be available for work. In other words, Montana's economy is not projected to create sufficient jobs for those who are already here (or were here in 1970).

The major implication of these calculations is for continual outmigration in

Table 3.2

Potential Labor Force, Revised Employment Projections, and Potential "Job Gap," Montana 1980 and 1985

	Potential Labor Force and Employed Persons		
	1970 (Actual)	1980	1985
Labor Force	268,800	321,900	342,100
Unemployment (at 6 percent)	--	19,300	20,500
Employed persons	--	302,600	321,600

	Revised Employment Projections[a]		
	1970 (Actual)	1980	1985
OBERS "C"	254,088	270,000	NA
OBERS "E"	254,088	277,200	280,900
Montana Economic Study	254,088	277,600	NA
NPA	254,088	285,200	292,600

	Potential "Job Gap"	
Maximum[b]	25,400	40,700
Maximum[c]	17,400	29,000

[a] Assumptions have been standardized. See text.

[b] Using OBERS "E" Employment Projections.

[c] Using NPA Employment Projections.

the 1970s and 1980s as Montanans are forced to leave in search of jobs. If there are two persons associated with every job, the implied net outmigration (this is the excess of those leaving over those moving in) is 34,800 to 50,800 from 1970 to 1980, with an additional 23,200-30,600 during the five year period 1980 to 1985.[13] The figures for the seventies are slightly less and those for the eighties are greater (assuming the trend would continue throughout the decade) than the net outmigration from Montana during the sixties (see table 1.1).

This analysis has emphasized projected labor market conditions and the continued outmigration of Montanans in search of jobs. But, what about those who remain? In a previous section, per capita personal income was used to measure the economic well-being of residents. This is not a perfect measure, it equates well-being with money income. But, it was shown that the potential bias due to the exclusion of nonmonetary benefits was probably not sufficient to disguise the underlying trends.

Alternative projections for Montana's per capita income, converted to constant 1958 dollars to eliminate the effect of inflation, are shown in table 3.3. The NPA and OBERS "E" use slightly different 1970 per capita incomes because the projections were not make at the same time and income estimates are periodically revised. Figures for 1968 are presented for the Montana Economic Study and OBERS "C" because they were prepared before 1970 data was available. (There apparently were minor differences even in the 1968 values.)

There is considerable variation between the alternative projections of per capita income in 1980, they range from a low of $3,330 for the Montana Economic

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[13] This is an aggregate participation rate of .50; not unreasonable in light of the fact that a greater than proportionate share of migrants tend to be in the prime working groups.

Table 3.3

Per Capita Personal Income, Actual and Projected Montana, 1970, 1980, and 1985

(In constant 1958 dollars)

	1970	1980	1985
OBERS "C"	$2,460[a]	$3,590	$ NA
Percent of U.S.	*85*[a]	*86*	
OBERS "E"	2,650	3,670	4,200
Percent of U.S.	*87*	*88*	*89*
Montana Economic Study	2,470[a]	3,330	NA
Percent of U.S.	*86*[a]	*79*	
NPA	2,660	3,800	4,480
Percent of U.S.	*88*	*86*	*83*

Sources: [OBERS "C"] *1972 OBERS Projections, Series "C"*, U.S. Water Resources Council, Washington, D.C., 1972, Vol. 5, pp. 112-115. [OBERS "E"] *1972 OBERS Projections, Series "E"*, U.S. Water Resources Council, Washington, D.C., 1974, Vol. 4, pp. 82-84. [Montana Economic Study] *Research Report of the Montana Economic Study*, Bureau of Business and Economic Research, University of Montana, Missoula, 1970, Vol. 2, Chapter 4, p. 4.41. [NPA] Joe Won Lee and William B.D. Hong, *Regional Economic Projections, 1960-1985*, Washington, D.C., National Planning Association, 1973, Report Number 73-R-1, p. 57.

[a] Per capita income for 1968.

Note: Per capita income projections have not been adjusted for differences in underlying assumptions.

Study to $3,800 for NPA. Differences in the level of per capita income may be due to dissimilar assumptions about the change in wages, population, and other factors. (They correspond to the unadjusted employment projections in table 3.1.) Rather than detailing these differences, an overview concerning the trends can be obtained by comparing the Montana incomes to the average for the United States. This identifies whether or not the well-being of the Montanans is projected to increase or decrease relative to average for the nation. Notice that there are differences between alternatives in the projected per capita income for the United States.

The four alternatives are evenly divided in their opinions concerning the relative trend of Montana's per capita income. OBERS "C" and "E" both project per capita income to grow slightly faster in Montana than in the United States. For example, OBERS "E" reported Montana's 1970 per capita income to be 87 percent of the nationwide average and this percentage is projected to rise to 88 percent and 89 percent in 1980 and 1985, respectively. On the other hand, the Montana Economic Study and NPA project a relative decline in Montana's per capita income.

On the surface the projections appear to be in serious conflict. But, the OBERS projection methodology contains a feature which almost assures that a state's per capita income will converge toward the national average.[14] Thus, the important point is not that Montana's income is projected to increase faster than the nation's--this is an integral part of the methodology; but, the rate at which Montana's figure approaches the United States. Both OBERS projections foresee a slow convergence toward the national average, only one percentage point from 1970 to 1980 and one more point between 1980 and 1985.

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[14] OBERS projections assume the earnings per worker in the individual industries at the national level to converge toward the all industry rate. This implies the gradual elimination of the "industry-mix" effect as a cause of spatial differences in per capita income. See 1972 OBERS Projections, Series "E", p. iii.

These projections do not paint a very rosy picture for Montanans. At best, their economic well-being may improve slightly relative to the rest of the nation--this is primarily an assumption, not a conclusion, of the projection. At worst, the relative decline of the past decades will continue so that per capita income will be nearly 20 percent below the national average by 1985. The economic well-being of Montanans will continue to improve, but at a rate far behind the rest of the nation.

What can be done to halt, or at least retard, the relative decline in Montana's per capita income? This is not an easy question to answer. It is a problem which Montanans will have to address during the coming decades. The only real advice that can be given is that undue emphasis should not be placed only on the quantity of new jobs, the quality of these positions is also important. Earlier, in computing the potential "job gap," no mention was made of the pay of the new positions. Technically, any additional positions could help to fill this void. But, if economic well-being is a criterion, new low-paying and seasonal jobs--such as those often associated with the tourist industry--are definitely not very attractive. The ideal form of employment would be stable positions in industries paying above-average wages. They would simultaneously reduce the "job gap" and help to moderate the relative decline in economic well-being.

The economic projections paint a dismal picture of Montana during the next decade. They foresee a "job gap" of 17,000 to 25,000 in 1980 and, at best, per capita income remaining well below the national average. These projections, as they stand, are simply cold hard numbers. One way to put them in perspective is to examine alternative industrial projects and estimate their potential impact on Montana's economy. This provides a meaningful way of assessing the changes required to alter the projected trends.

Table 3.4 presents the impacts associated with the opening of selected new industrial projects in Montana. The first is a pulp and paper mill employing 625 workers with average annual earnings of $13,100 per year; roughly analogous to the Hoerner-Waldorf Mill in Missoula.[15] The second is an oil refinery modeled after those in the Billings area with total employment of 225 and average earnings of $12,900 per year. The final example is a hypothetical manufacturing plant with 500 workers earning $10,000 per year.

All three industrial projects represent net additions to Montana's economic base and would lead to further changes elsewhere in the economy. The increase in derivative employment for each is also shown in table 3.4.[16] These figures should be interpreted with caution because they represent only the approximate change in derivative workers.[17] The exact impact depends on a number of factors

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[15] The annual earnings correspond to those reported for the various industries during 1974 by the Montana Employment Security Commission. They may not reflect the stated hourly wages because some employees may not have worked the entire year. Further, they include only those workers covered by unemployment insurance.

[16] The projection methodology is described in Paul E. Polzin, "An Income Model for the State of Montana," Bureau of Business and Economic Research, University of Montana, unpublished manuscript, 1974, pp. 16-25. The earnings per derivative worker for 1974 was projected on the basis of unpublished data provided by the Montana Employment Security Commission.

[17] FTE derivative employment is reported because it includes a rough correction for multiple jobholders and may be compared to the "job gap" projections which utilize the U.S. Census Bureau's concept of employment.

Table 3.4

Projected Statewide Impact of Selected New Industrial Projects

	Pulp and Paper Mill	Oil Refinery	Manufacturing Plant
Primary Industries			
Increase in employment	625	225	500
Average annual earnings per worker (1974 pay scales)	$13,100	$12,900	$10,000
Derivative Industries			
Increase in employment (FTE equivalents)[a]	1,420	500	870
Average annual earnings per worker (projected 1974 FTE equivalent)[a]	$ 9,800	$ 9,800	$ 9,800
Total Increase in Employment	2,045	725	1,370

[a] FTE equivalents work 2,000 hours per year.

which are unique to each project--for example, the precise geographic location of the facility and the characteristics of the local labor market. Nevertheless, the figures do give a rough idea of the increase in derivative employment that may be expected from new facilities with the general characteristics of those shown.

A new pulp and paper mill equivalent to Hoerner-Waldorf, which is one of the largest of its kind in the world, is projected to directly and indirectly increase employment in Montana by about 2,000 workers. Comparing this figure to those in table 3.2 reveals that from 8 to 12 plants of this size would have to be built in Montana in order to eliminate the "job gap" in 1980! Similarly, it would require from 24 to 35 new oil refineries or 12 to 18 new manufacturing plants to accomplish this goal!

I am not suggesting that these figures provide the foundation for economic development policies in Montana. There are serious doubts that they could be realized--even if deemed appropriate. Rather, I simply want to put the earlier projections into concrete terms which can be easily understood. That is, the minimum "job gap" of 17,400, even though it is less than seven percent of total employment during 1970, is equivalent to about eight new pulp mills, twenty-five new oil refineries, or twelve new manufacturing plants. The figures are proportionately larger for the maximum projected "job gap."

Once again, I want to emphasize the rough nature of these calculations. Economics is not yet an exact science which can precisely predict the increase in employment to the last job. But, regardless of the exact numbers, the general conclusion is unmistakable; it would require a significant addition to Montana's economic base to provide sufficient jobs to eliminate the "job gap."

The analysis summarized in table 3.4 does provide a means for evaluating the relative efficiency of alternative projects in creating new jobs. Notice that the pulp mill and oil refinery are projected to increase derivative employment proportionately greater than the hypothetical manufacturing plant. The ratio of derivative to primary employment is 2.2 to 2.3 for the former and about 1.7 for the latter. The major reason for this difference is the higher earnings per worker in the pulp mill and oil refinery. The higher the pay of a new primary job, the greater will be the increase in derivative employment. Thus, if the impact on employment is to be maximized, emphasis should be placed on projects providing well-paying primary employment. In addition to their effect on derivative employment, these positions would also aid in increasing Montana's low per capita income.[18]

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[18] Notice that the earnings of derivative workers is not influenced by the pay of the new primary jobs. The effect on per capita income would result only from the above-average earnings of the increased employment in primary industries.

CERTIFICATE OF SERVICE BY MAIL

THIS IS TO CERTIFY that on the 9th day of January, 1975, a true and correct copy of the foregoing Statement was mailed, postage prepaid, at Great Falls, Montana, to the following:

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EXAMINATION OF DR. PAUL E. POLZIN

Cross, by Department of Natural Resources and Conservation

By Mr. Shenker:

Q Mr. Polzin, are you a colleague of Maxine Johnson?

A Yes, I am.

Q You work closely with her in some projects?

A On some projects, yes.

Q Have you worked closely with her on projects touching on the subject of your testimony that you have prepared for this proceeding?

A No.

Q Oh, you mean you have done no work with Maxine Johnson on any of the subjects of the economy of the state of Montana?

A We have collaborated on some of the source material which I cite in my testimony. I did not collaborate with her on the preparation of the testimony itself.

Q I didn't ask you if you collaborated with her on the testimony itself. Yes, on source material, that is to say other economic studies that you have been at work on in Montana, you have worked with Miss Johnson in the past?

A Correct.

Q You are aware, are you not, Mr. Polzin, that in the academic fraternity or sorority or whatever the neutral term is as between fraternity and sorority, one colleague must rely upon another in the area of expertise; that happens all the time, doesn't it?

A Yes.

Q You are aware, I take it, Mr. Polzin, that Miss Johnson is a member of the board of directors of the Montana Power Company?

A Yes.

Q Did you take into consideration any potential conflict of interest she might have in the expression of her views on subjects related to Montana Power Company's interest as an applicant in this proceeding?

A Most of the, in fact all of the research, for this testimony --

Q I didn't ask you about this testimony, Mr. Polzin.

MR. HILLEY: Objection. May the witness answer the question; I don't think he should be badgered.

HEARINGS EXAMINER: You may go ahead and complete your answer, and then see if you understand the question. If you don't, ask him to rephrase the question.

A Mrs. Johnson, I believe, was appointed to the board of directors for the Montana Power Company about September of this year. Most of the research which I have cited in my testimony and much of the original research in the testimony was completed before she was appointed; and even if it weren't, I don't really see the relevance.

Q Do you know if there's any conflict of interest that a member of a board of directors of an applicant company is a neutral, dispassionate, objective, academic assessor of the same kinds of problems that you are viewing here?

A She was appointed after this research had been completed.

Q Yes, I keep hearing you say that, Mr. Polzin, but I wonder if you could answer my question now. Do you see the conflict of interest? Now the answer to that is either yes or no; either you see it or you don't see it.

A I think that, knowing Maxine and knowing the work that she has done and the way in which she does the work, I would doubt very seriously if her position with the Montana Power Company would influence her reported research.

Q Then you see no conflict of interest between her loyalty to her sworn obligation imposed by law as a member of the board of directors of the Montana Power Company, and the reports that she may have prepared on subjects of interest to that company?

A I would have to evaluate the reports when I see them.

Q Do you see any conflict of interest to anybody serving on the board of the Montana Power Company and issuing reports on subjects of interest to that company?

A There could be.

Q In your statement of testimony, Mr. Polzin, you comment on the relationship between national American economic patterns over the last couple of decades, and Montana's economic patterns over the last couple of decades; and state, at the top of page 2, that Montana's economic position relative to the rest of the nation deteriorated significantly. Would I correctly infer, sir, that what you are trying to say there is not that Montana's position has absolutely deteriorated, in the sense that it has declined in its growth indicators as your have compiled them, but that Montana has not grown as fast as other areas in the United States; is that what you're trying to tell us?

A When compared to the average for the nation in terms of many of the statistics that I've looked at, and employment income and what have you, the increases in the Montana statistics have been no where near as fast as the increases in the national office.

Q There have been increases both nationally and locally, but Montana's increases haven't been as fast as the average national?

A It depends on the particular data series you're looking at, but, in general, that is a fair generalization.

Q On page 6 of your statement, Dr. Polzin, the second new paragraph on that page, starting at line 11, you comment on the allegation that Montana's rural setting and way of life attract many persons disillusioned with the frantic pace of city life, and conclude that the image of the city dweller escaping to Montana isn't true, concluding further that a current picture would show more Montanans moving to urban areas. From the colorfulness of the language which you employ, sir, do I correctly infer that you think that this is a trend which ought to be encouraged?

A What trend is that?

Q Moving to urban areas?

A No, I don't make that statement at all; I don't make that implication at all.

Q How do you feel about that?

A About what? About people moving to urban areas?

Q Yes.

A Well, if you look at it on an individual level, it's where a person prefers to live. I think if you look at it historically, you will find that over the last forty years there has been significant net out migration from rural areas into urban areas. In other words, one of the reasons for this is that there have not been enough jobs created in the rural areas to provide employment for all the people who were entering the labor force, and there were employment opportunities in the urban areas. This then has led to much of the rural-urban migration in the past.

Q You say that in your statement, sir. What I am trying to find out is whether you think it's a good thing or a bad thing within professional economists' terms in policy senses to accelerate the trend away from the Montana rural setting way of life?

A That is neither good nor bad.

Q That is neither good nor bad. One of the functions of an economist, is it not, Dr. Polzin, is to provide tools with which decision-makers can then enter into those kinds of policies which they believe are best for the society; isn't that what an economist does?

A One of the things.

Q Yes. So having told us that there has been a net migration into urbanization in Montana, I take it it would then be available for those who have to make decisions here, that they would either like to accelerate or decelerate such a trend, or to maintain the status quo; wouldn't that be available to the decision?

A Well, that could be an opinion that a decision-maker has; I'm not sure whether there are many decison-makers, outside of an absolute dictator, who could enforce such decision. I'm not quite sure that policy-makers, even though they may have a personal opinion as to whether or not this is a good or bad thing, we really can't do much about it.

Q Well, if you want to increase jobs in the rural sector as opposed to any urban sector, wouldn't you look to agriculture for increasing jobs?

A No.

Q Where would you look to increasing jobs in the rural as opposed to the urban sectors?

A In Montana, or in general?

Q Yes.

A There are very few real opportunities for industrial development in Montana. For example, some people have been citing tourism as being a real benefit and providing an industrial alternative, or providing a clean growth industry for Montana. I recently completed some research which was published in the Montana Business Quarterly where we take a close look at tourism, and its potential as a source of industrial development for Montana. One of the conclusions of that study was that about $.22 of every dollar spent by out of state tourists ends up in the pockets of Montanans as direct income. So, if we take a real wildly optimistic estimate of just how much do out of state tourists spend in Montana, let's say $300,000,000.00; that's higher than a Department of Highways estimate who are in the business of making that estimate. But if we say that $300,000,000.00 was spent by out of state tourists in Montana, and take 22 percent of that, that's about $50,000,000.00 or $60,000,000.00, I think; this means that out of state tourism generates about $50,000,000.00 to $60,000,000.00 in terms of direct income to Montana. That is roughly the same as the federal military payroll for Montana. In other words, tourism ranks about the same as the federal military as an important industrial source in Montana. Even if we double the importance of tourism, it still will not have a very significant impact on Montana. All right, what about some other industrial alternatives?

Q Dr. Polzin, what question do you think you are answering?

A If you were to promote job growth in rural areas in Montana, what industries would you look at; what are the alternatives for job growth in Montana?

Q Well, I didn't ask you anything about industries, sir.

A Well, you asked how would you promote job growth in Montana; one alternative for promoting jobs in Montana is tourism, and that's the question I was answering.

Q That confuses me, Dr. Polzin. You mean it's better for rural folks than for urban folks to promote tourism?

A No, that's not the question you asked. You asked how can you promote jobs, how can you create jobs in rural areas?

Q Yes.

A And then I asked you are we talking about Montana, and you said yes; so how do we create more jobs in Montana?

Q Well, how does tourism fit into creating jobs in rural areas in Montana?

A That's where much of our tourist industry is located, the dude ranches, the motels.

Q But you tell me that that's not a good way to promote jobs in rural areas.

A It is a way to increase employment in Montana, but then I went on to say it's not a very good way.

Q What are the good ways to promote jobs in rural areas in Montana?

A You got me.

Q You don't know of any?

A I don't know of any; I don't know of any really good ones, there are some alternatives that help to fill the gap.

Q Would you conclude, therefore, Dr. Polzin, that it's simply illusory to try and maintain the lifestyle of a rural setting for Montanans and, indeed, that it would be shallow and selfish to try and do that?

A Would you repeat the question, please?

Q Would you conclude, sir, that it is illusory to try and promote jobs in rural areas in Montana to maintain the rural setting and way of life of Montanans, and that it would be shallow and selfish to try and do that?

A Are you suggesting that by promoting job growth in rural areas, you are maintaining the rural way of life?

Q I'm asking you a question, Dr. Polzin.

A I'm trying to understand what you're asking; I seem to see a conflict there. It's kind of hard to answer -- what you seem to be saying is that if we -- in order -- I don't really know what you're saying at all.

Q Well, I think you better not try and answer what you don't know that I'm asking you about. Let me see if I can help you some, then, Dr. Polzin. You make the statement that those who believe that a net out migration from Montana accompanied by an influx of non-Montanans is a bad thing are being shallow and selfish, right?

A May I try to rephrase what I think you're asking?

Q Sure, it's your statement that I'm trying to get a handle on; you tell me.

A Okay. What I think you're saying is that somewhere toward the end of this statement, I don't really remember where, that simply because we view -- or, you know, if we look around us we can observe a lot of apparent newcomers living here in Montana; these are people who have moved into Montana. But when we just look around us, we don't see the people who have left, and that it's a rather short view, as for instance looking at only one side of the coin; if we just look at the in-migrants to Montana without considering those who left. If we do take a balanced view and compare the number of people who left Montana to the number of people who have entered Montana between '65 and '70, which is the only hard data that we have, you will find that many more people left Montana than entered Montana. So, the balanced picture I'm saying let's look at net migration, not simply gross flows. Let's compare gross in-migration to gross out-migration and talk about net migration. Is that what you were asking?

A No, when you look at that net balance, on page 6 of your statement, you state your conclusions statistically that the belief that Montanans are being overrun by outsiders, sometimes called carpetbaggers or sir galahads or something of that sort, that belief is not statistically well grounded; and then point out that folks who look at the correctly grounded statistics, which you have just referred to, a net out-migration, in some cases respond with glee. Now it's that view that you regard as shallow and selfish, is that right, at the top of page 9 where you conclude?

A I think, yes; I think that can be a very selfish viewpoint.

Q Lots of things can be lots of things; it's your conclusion stated without any potentiality to it that that is a very shallow and selfish viewpoint. Do you still hold that conclusion?

A Yes, because it does not take into account the suffering, and the people who have left the state who would liked to have stayed in the state. In that sense, it's a very selfish viewpoint.

Q Primarily, your view, of course, is comfortable only up to the year 1970 in terms of migration statistics because after that you tell us in your statement that it's difficult to rely with confidence on the projections of population; is that correct?

A Yes.

Q Prior to 1970, the main reason, as I understand it, you conclude that there occurred a net out migration was that there were insufficient jobs for people to stay in Montana; is that correct?

A Yes.

Q Now, Dr. Polzin, as I understand it, that occurred during a time period in which there was more than adequate electric generating power to fuel industries in Montana. That's true, isn't it?

A You mean the slow growth in employment between 1950 and 1970, this was a period in which there was a sufficient supply of electricity?

Q Yes, sir.

A I cannot answer about the supply of electricity; I do not know. But we did not, obviously, experience shortages during that time.

Q Let me ask you to assume, Dr. Polzin, as the evidence in this proceeding shows, that there was no shortage and that there was an adequacy of electric generating power in Montana during that period of time. With that assumption, would you conclude, Dr. Polzin, that the factor of electrical generating power was not a determinant of increased growth of jobs in Montana?

A Well, since we had very little increased growth in jobs in Montana during that time, and you are willing to stipulate that we had sufficient energy supplies -- in other words -- would you restate your statement again? If you are saying, for example, that since we had enough electricity during the '50's or '60's, and this did not provide a stimulus to employment during then, then your obvious implication was why would excess supplies of electricity during the '70's and '80's help us; is that what you're coming to?

Q I don't think we can come to that yet, Dr. Polzin, based upon what you have already told me as to your concern with the population statistics after 1970. I'm trying to focus on only the material in which you're comfortable, that's the 1950 to 1970 historical period, and you have just referred to an obvious implication. I think it's obvious, but the record does not have your conclusion on that subject yet. Do you agree that the presence of electrical generating power in Montana during that period, 1950 to 1970, was not a determinant of having sufficient increased economic activity to provide more jobs here?

A During the period between 1950 and 1970, there was apparent sufficient electrical generating capacities throughout the nation; so, I really don't -- it was not a factor here in Montana, and I also believe it was probably not a factor elsewhere in the nation. In other words, we did not have a comparative advantage in the availability of power simply because all other areas also had the availability of power, so it was not an attractive force for industry.

Q Good, okay. If you'll turn with me to page 26 of your statement, there you refer to the cyclical nature of economies, and looking at Montana's economy, you find that the cyclical effect upon the Montana economy was one of the smallest of all the states?

A I cite a study which concluded that.

Q Right, and you agree with that conclusion, do you not?

A Yes.

Q I take it what that means, and correct me if I'm wrong, is that Montana had one of the least fluctuations from time to time in the growth or decrease of its economy; is that what you mean?

A No, no, that does not mean that.

Q Tell me what it does mean when you say it's the least cyclical?

A When we talk about cyclical sensitivity, we're talking about the response of the Montana economy to the national business cycle. In other words, the response of the Montana economy to the current recession, to the recession of '58. In other words, the response of the Montana economy to the national ups and downs.

Q Well, isn't that a quantification response?

A It's a quantifiable response.

Q All right. Do you not believe that that means the extent to which Montana moved up and down with the rest of the nation, or grew or decreased in connection with the rest of the nation? Isn't that what it means?

A It's the amount that our economy responded to pressures generated by the national economic conditions, right.

Q Well, when you say responded, that doesn't tell me anything, Dr. Polzin, as to what the nature of the response was. Does it mean the extent to which it moved up or down as the rest of the nation moved up or down?

A Yes.

Q Okay, thank you. On page 30 of your statement, Dr. Polzin, you have some critical things to say about your colleagues in the field of economics, noting that they haven't had a very good track record, sort of like the proverbial weather man and the roasting that he gets for not having predicted properly what the weather is going to be; and you conclude at line 23 that that bad track record seriously impairs the credibility of economists and throws doubt on the usefulness of examining future trends in Montana's economy. I assume, Dr. Polzin, from the fact of your testimony in this proceeding, that notwithstanding the impairment of credibility and the doubt on the usefullness of examination, that you still think it ought to be done?

A I go on to say, though, why do economists have such an apparent bad track record? It's because, one, sometimes economists are a little careless when they make statements, and they are misinterpreted; on the other hand, it's also due to the misinterpretation of laymen of the statements of economists. They don't listen very carefully sometimes; they just look for key phrases.

Q Well, then I take it your answer to my question is yes, you think that one should go ahead and make the predictions based upon economic indicators?

A And carefully outline what the assumptions and the limitations of that analysis are.

Q With proper care, then, those projections should be made?

A Yes.

Q Well, taking a look at some projections then, Dr. Polzin, you spend considerable time in your statement explicating some of the population projections that can be made based upon a number of different studies that have occurred between the years 1970 and 1985. Those are set forth on page 33 of your statement. I wanted to make sure that I understood the comparisons that you were drawing. If you look first at the top part of table 3.1. Those are four sets of projections based upon population studies; is that correct?

A Those are four sets of population projections, or three sets because NPA doesn't have a population projection.

Q They just have the figure of what the actual employment was in 1970, and they make their projections -- excuse me -- they have their figure on the actual population, but their projections are on employment only?

A Right, they only make employment projections. These are three alternative projections of Montana's population.

Q Okay. Now if I understand correctly what those projections tell us, taking the first of them, which is one of the U.S. Bureau of Census indicators?

A No, this was a set of -- you mean OBEERS?

Q Yes.

A This is a set of projections prepared that are called OBEERS; that's an acronym standing for Office of Business Economics and Economic Research Service. Those are the two federal agencies which finance these projections.

Q They get their figures from the U.S. Bureau of Census, do they not?

A Well, they take the 1970 figure from the Bureau of Census, and then they make their own projections outward.

Q They got, you might say, the high road and the low road for projecting on population?

A Well, I think about the high road is Montana economics slater at 725.

Q Well, if you just take the two federal projections, there is one that is higher than the other?

A Yes, right.

Q Right, and if we look at those, as I understand what they are telling us, between 1970 and 1980, the decade of the '70's, the first of the projections which you have listed would amount to a population increase of something in the order of 5/10 of 1 percent a year?

A I haven't calculated that out, but that could be correct.

Q Okay, and the second of the federal projections that you have listed, of course, shows a net decline in population between 1970 and 1980; that, too, is approximately 5/10 of 1 percent per year on the minus side, right, sir?

A No, I just was agreeing that that was 5/10 of 1 percent down while the other one was up.

Q Okay. The nods of the head don't get on the record, Dr. Polzin; you have to say yes or no. All right then, of course, the Montana economic study is relatively close to the first of the two federal projections on population, so it would be somewhere in the same ball park of about 1/2 of 1 percent growth per year over that decade from 1970 to 1980?

A Yes.

Q Then let's take a look at the employment figures. The first of the two federal projections takes us among the years 1970 and 1980, and that would show an increase in that decade of approximately 1.2 percent in the employment force; is that correct?

A You mean a total increase between '70 and '80 of 1.2 percent?

Q No, on an annual basis.

A Average annual basis?

Q Yes, sir.

A If that is correct; I haven't calculated it out.

Q But that looks about right. Then if you look at the second of your federal projections, that would show an increase in the 1970 to 1980 decade of approximately 7/10 of 1 percent per year?

A If that's correct.

Q And from 1980 to 1985, that half of a decade, essentially no growth at all in employment projections, correct?

A Yes.

Q Then the Montana economic study, adjusted in order to be comparable with the first two that we have talked about, that would project from 1970 to 1980 a population growth of 9/10 of 1 percent, correct?

A If that's what it works out to be.

Q Well, that looks like it's about right, doesn't it?

A Right, since I haven't done the arithmetic, I would have to take your word on it.

Q Sure, but it's really not very complicated arithmetic. We know that 10 percent of 254,000 would be 25,400, and if you added that on to the 254,000, that would tell you you had 10 percent over ten years; since we're less than what that figure would be, it's got to be something less than 1 percent per year, right?

A It appears so.

Q Sure. Finally, the last of the studies which you have, the NPA study on employment growth, would project from 254,000 as the employment force in 1970 to 319,000 as the employment force in 1985, that would show -- well, let's see. That gives us a 1980 base and also a 1985 base. Between 1980 and 1985, there would be a growth of something like 1 percent per year; would that be right?

A I think so.

Q Are those the kinds of figures, Dr. Polzin, on which folks should rely as they prepare economic projections?

A Yes, I think so.

Q You do some massaging of those figures for the various reasons that you set forth in your statement, and when you get to page 40, you have some revised employment projections. If you would look with me at line 11 --

A What line number?

Q Eleven. You had some revised employment projections that moved from 281,200 in 1980 up to 292,600 in 1985, and that's a projection of something less than 1 percent per year; isn't it?

A Yes.

Q Now you conclude from the various projections that you have made, Dr. Polzin, that there is not a very rosey picture that should be painted for Montanans on any kind of comparison with the rates of growth here and the potential rates of growth on a national average; is that right?

A In terms of employment income, yes, that is correct; I do make that implication.

Q The range of alternatives which you project are at the top side a slight improvement in the economic condition of Montana over the next decade, and on the bottom side something like a 20 percent decrease in the comparison between Montana's income and national income?

A Now you're going over the per capita income?

Q That's an indicator that you use, isn't it?

A Yes, right; I was just wondering if you were still talking about employment or whether you had gone on to --

Q If I was going on to your projections --

A Right, about per capita income.

Q Yes, it's on page 47 of your statement. You talk about projections painting a rosey picture for Montanans and, I think you're describing a range of slight increase at the top side and a 20 percent decrease on the bottom side; is that right?

A Well, it's not really a 20 percent decrease; it's a decline of 1 or 2 percentage points. I don't know how you want to convert that to a 20 percent decline; I'm not sure.

Q Well, I'm trying to use your language, it's line 8 of page 47, and you say that at worst the relative decline --

A Oh, okay, I'm talking about 20 percentage points below, not a 20 percent change.

Q All right. That's the worst, though, that Montana will be about 20 percent below the national average by 1985?

A That's what these projections state.

Q So, the possibility is that the economic well-being of Montanans and the various ways that you measure that may continue to improve, but at a rate that will lag behind the rest of the nation?

A That's correct.

Q Do you think, Dr. Polzin, that an increase in the rates of electrical power would have any influence on that range?

A It could. You mean in terms of improving Montana's income relative to the nation?

Q Yes.

A Yes, it could.

Q What do you think that effect would be?

A Well, in the direct effect, you could be talking about the high income, or the relatively high income of the electrical workers, and the electrical generation workers, and the mine workers directly associated with the generation of electricity. Also, if the availability of electricity does provide a location incentive and it does entice other industries to locate into Montana, you're basically talking about manufacturing industries; and manufacturing industries, historically, have had higher incomes than non-manufacturing industries. This would tend to raise our average.

Q You conclude in your statement that the ideal form of employment for Montana would be stable positions in industries paying above average wages?

A Right. If you want to raise the average, the easiest way to raise the average is to have your new workers have above average earnings.

Q Is mining an above average wage paying industry?

A Yes, very much so, especially coal mining.

Q Is the wood products industry an above average wage paying industry.

A Yes, it is.

Q How about the railroad industry?

A Yes, it is.

Q Well, if you had the choice, Dr. Polzin, and your objectives were to increase the economic well-being of Montanans, and your choice was to create 350 jobs in the railroad industry or to create 95 jobs in the coal generation, coal-fired power generation industry, which would you choose?

A That's a tough choice. The average earnings in both are relatively close; they are about $17,000 or $18,000 per worker per year each. That would be a tough one to call.

Q Why is that tough when the comparative number of jobs is four or five to one?

A Oh, I'm sorry. I thought you were talking only in terms of earnings per worker.

Q No, no, no.

A You also included numbers of workers with that?

Q Yes, I did.

A Well, then the number of -- if they both have the same earnings, and you're talking about more railroad jobs, obviously the more railroad jobs would be beneficial.

Q Now you have concluded elsewhere, have you not, Dr. Polzin, that unit trains are presently the most economical method of transporting Montana coal to their markets?

A That's correct.

Q You don't know of any reason to change that view, do you?

A Well, I have been reading about slurry lines, and there have been cost studies done on slurry lines in the last couple of years. They are appearing more and more in the press, or reports of cost conditions on slurry lines are appearing more and more. Slurry lines seem to be the only alternative in terms of strictly dollars per ton mile or some objective cost figure. Slurry lines appear to be the only economical way of transporting coal, the only alternative to railroads that appear to be cost effective in that way.

Q You know, do you not, Dr. Polzin, that there is considerable evidence these days that the price of electricity will tend to dampen the historical rate of increase and demand for electricity?

A Yes, that's well-known.

Q I take it you find that evidence persuasive?

A That this will continue?

Q That the price of electricity --

A That the rising price of electricity will continue to dampen the former -- yes, I think that will continue.

Q And your conclusion, generally speaking, Dr. Polzin, as to the effect of the price of electricity on the demand, tells you that any number of mine-mouth generating plants can materialize only if the national demand for electricity grows at past historical rates, and that there are serious problems with nuclear plants?

A Did you quote that right?

Q Well, I thought it was a pretty good job. I didn't start my question the same way you wrote it in your paper.

A I know. That first clause didn't seem to follow with the second clause.

Q Yes; you say, "To summarize" --

A Okay.

Q "The large number of mine-mouth plants predicted for Montana will materialize only if" --

A Ah, if; okay.

Q "The national demand for electricity grows at historical rates, and serious problems with nuclear plants materialize."

A Yes, what I was speaking of there is the North Central Power Study which came out in about 1970. The North Central Power Study, I think, identified about 25 potential mine-mouth generating sites in eastern Montana, or sites which were potentially suited for mine-mouth generation. When that study appeared, it created quite a havoc; the idea of having 20 electrical generating plants out in eastern Montana was quite shocking to some people. The point I was bringing at there was that this study, the 1970 North Central Power Study, was based on a projected rate of increase in the demand for electricity of 7 or 8 percent a year. Now, since we have a much slower rate of increase in the demand for electricity, I do not think that there is the same probability or the possibility that we will even need all these 22 sites because the rate of increase is going to be slower.

Q And you're talking not only about Montana's rate of increase, but national rates of increase; aren't you?

A Right, well, that is why they identify 22 sites in Montana; it was for the export of power, not for the internal use of electricity. That's why they identified so many of them.

Q Now you talk also, Dr. Polzin, about the use of coal for the production of natural gas?

A Right.

Q What does the price of natural gas currently have to do with the use of coal for that purpose?

A Currently the interstate regulative price of natural gas is about $.50 to $.60 per thousand cubic feet. The latest cost estimates that I have seen on synthetic natural gas is about $4.00 per thousand cubic feet. So, obviously, synthetic natural gas cost is very much higher than the current regulative price of natural gas. If the federal government would de-regulate the price of natural gas, obviously the price of natural gas would increase. This would have two impacts; one, again like electricity, it would tend to dampen the rate of increase in the demand for natural gas; and on the other hand, it would tend to stimulate the production of natural gas. How much it will stimulate the production is open to debate even among economists, but I think there is no doubt that it would definitely stimulate the production of natural gas. All right, the question then is if the federal government deregulates the price of natural gas, how far will it rise? Well, it will have to rise to at least $4.00 per thousand cubic feet in order to make synthetic natural gas even a viable alternative. There are a lot of studies that are being done right now, not a lot, but the one that I can think of where they are trying to predict just how far the market will -- if we let the natural gas price float, what will the market price for natural gas be; and they don't suggest an increase anywhere near that magnitude. For example, they don't suggest that the price of natural gas, if it were de-regulated, would increase 8 fold. So, we have some doubt there as to whether or not, even if the price of natural gas were deregulated, gasification would become profitable; and then this leads into will Montana coal be used for gasification? Only if the price of natural gas rises so as to make artificial natural gas, synthetic natural gas, compatible or cost effective.

Q You mentioned a couple of figures, one was $.60 and one was $4.00. Of course, those figures change from time to time, too, and as they grow closer to parity, then there would be more of an influence on the desirability economically of producing synthetic natural gas?

A Yes, the higher the price of natural natural gas, the greater will be the incentive, relative incentive, to produce synthetic natural gas.

Q And as you draw your conclusions, Dr. Polzin, from looking at Montana and the use of its coal in the context of the national energy picture, the overriding feature is uncertainty?

A That's correct.

Q If we take a look at the question that we discussed earlier with you, the one of employment, when you look at a gasification plant, the number of jobs which it would generate dwarfs the impact of electrical generating plants?

A Definitely.

Q Both gasification plants and electrical generating plants require the use of water for the processes; do they not?

A Yes, they do.

Q And gasification plants take something like 1/3 of the amount of water that electrical generating plants take?

A It depends upon what size of electrical generating plants you're looking at.

Q Well, the comparisons that you made, Dr. Polzin, of electrical generation --

A It's a 500 megawatt plant, which is roughly halfway in between Colstrip 1 and 2 and 3 and 4.

Q Right. In your comparison, you believe that gasification would take something like 10,000 acre feet per year as of 1980 and 20,000 acre feet per year as of 1985 of water, whereas electrical generation would take 37,080 feet in 1980 or something like four times the amount --

A Those were the figures current as of the publication of that report which is about a year old. As new technologies become operational and as there is further incentive to concerve water, I would have no doubt that these figures will be revised, but those were the figures as of the publication of that report.

Q About four to one electrical over gasification in 1980?

A For that size -- I have looked at a very specific scenario there.

Q Yes.

A I mean you can't just say four to one electricity. I have looked at a very specific scenario there.

Q Yes, indeed, you were looking at a Montana scenario in seven counties in Montana.

A That's correct.

Q Which included Rosebud County, Yellowstone, Treasure, Musselshell, Custer, Powder River, and Big Horn County.

A And Treasure County.

Q I thought I mentioned that. One last question, Dr. Polzin; are you familiar with the proposed synthetic fuels program in the federal administration?

A I know of its existence; I do not know much of the details about it, no.

Q You know that its general contour is to take the risk out of the production of synthetic natural gas?

A Right, I would anticipate that would be its profferance because that's been the whole problem with gasification is that, apparently, private industry is unwilling to take the risk of going ahead with gasification; one, because they don't know what's going to happen to the regulative price of natural gas, and two, gasification is very expensive; they have trouble raising the funds. So I would anticipate that would be what the feds would try and do.

Q Sure. Well, the federal program particularly aims at the last point that you just mentioned on financing is to guarantee the equity or debt necessary to do the financing; do you understand that?

A Yes.

Q What effect would that have on the production of synthetic natural gas?

A Well, any subsidy by any government, federal or state, could enhance or could increase the probability of gasification plants materializing.

MR. SHENKER: Nothing further; thank you.

HEARINGS EXAMINER: Mr. Meloy.

Cross, by Northern Cheyenne Tribe, Inc.

By Mr. Meloy:

Q Mr. Polzin, your statement contains numerous tables and many numbers, but you also include many references to the fact that either economists should not be predicting, or you would not predict on the basis of certain numbers. After I finished reading your statement several times, the question occurred to me and I would like you to summarize for me what it is that you're saying relative to units 3 and 4 at Colstrip?

A I'm providing the economic background for the state of Montana. What I am saying is that the Montana economy, when measured in terms of employment, when measured in terms of income, will not be performing very well over the next ten or fifteen years. Our employment is projected to grow -- I mean the number of jobs that will be created is projected to be less than the number of people who will be looking for jobs. Our per capita income which is a measure of economic well-being is projected at best to improve slightly relative to the national average; at worst it would decline relative to the national average. So this is the economic context for the state as a whole.

Q What does that say then, in your opinion, about units 3 and 4 at Colstrip?

A Well, to do a study of Colstrip 3 and 4, to do any site specific study, requires a heck of a lot of work, and we had assumed that this would have been provided by Montana Power Company. I was only intended, or I only wanted to prepare, I only did prepare the umbrella, the overview, the economic setting for the state as a whole. Now in this other report which was quoted earlier I spent a lot of time setting up a very specific scenario, and I analyzed that scenario extensively because it does take a heck of a lot of work to derive the implications for a site specific area, and that's why --

Q Do you know how many permanent employees will be working at 3 and 4 if they're certified?

A Permanent workers; are you including coal miners or not coal miners?

Q Well, do you have any reason to believe that the coal will be mined regardless of whether certification occurs?

A No.

Q Then just power plant workers?

A About 96 or 100, 110; 90 to 110, somewhere in that neighborhood. This is for both 3 and 4 total, right?

Q Yes. And what percentage does that rate to the total unemployment picture as you might project it when certification and the plants came into operation?

A It would be a very small percent of the total; in other words, Colstrip 3 and 4 by themselves are not going to turn the state around. They are not the panacea for economic growth in Montana. But then as I mentioned earlier, I can't think of anything else that is either; I can't think of any other large project, big project, which could come into the state, and really turn our economy around. If we were really interested, I mean if we were really trying to eliminate this job gap, if we're really trying to provide employment opportunities for Montana, I think the best that we can do is try and peck away at it; you know a little project here, a little project there because I don't think we're going to get the one big project, you know the phantom automobile assembly line that's going to appear some place or was supposed to appear sometime in the last 20 years which is going to employ 15,000 to 20,000 workers. That's just not going to occur.

Q Do several small power plants employ more employees than a big one?

A Say it again, please?

Q Do two small power plants employ as many employees as, say, two big ones?

A You mean in this particular context, does Colstrip 1 and 2 employ as many as 3 and 4?

Q Yes.

A They are pretty close.

Q So we could gain as much in terms of employment from building a couple of small power plants as we can from building two 700 megawatters?

A In terms of employment?

Q Yes.

A I would anticipate that they would probably -- the cost of producing electricity in terms of dollars would probably be higher in the smaller plants 'cause you can't take advantage of any economies of scale that might be available in the larger plants.

Q Yes, but economies of scale sometimes means fewer employees?

A It can.

Q Yes. You're from Michigan; is that right?

A Correct.

Q You have a Ph.D. in economics from Michigan State; is that right?

A That's correct.

Q What is a doctor of economics from Michigan State doing in Montana?

A This is a job opening that opened up in '68, and I came out here and I've stayed here ever since. I like the people I work with and for.

Q What were the reasons that you came out here; just the job opening?

A Yes, it was.

Q Is it possible that someone who may have gotten a degree in economics in Montana might not have gotten the job that you got because you were available from Michigan?

MR. HILLEY: I'm going to object. This is pure speculation. I don't think that he can answer the question. Not only that, everything is possible.

HEARINGS EXAMINER: Overruled; all he's got to answer is it's possible. You can answer.

WITNESS: I should answer?

HEARINGS EXAMINER: Yes, you can answer.

A I am not sure, but I think the only Ph.D. program in economics in Montana is down at Bozeman, and I believe their specialty down there is agricultural economics. When I came here, the position was not for an agricultural economist. I really don't know the curriculum at the economics department at Bozeman, but that's the only Ph.D. economics granting program in the state that I know of.

Q Well, in your statement you talk about people leaving and people coming?

A Yes.

Q From your own experience, I'm inquiring about the reasons why you came and the reasons why maybe a Montanan might have left; and the answer to that, I take it, is that, with regard to economics professors, we just don't train economics professors in Montana?

A I'm sure the people in Bozeman would disagree with that, but I would not.

Q Well, we don't train folks other than in agricultural economics in Montana?

A Yes.

Q Are there economists, have you read any studies from economists which attempt to quantify what may be non-quantifiable amenities?

A We've been trying to do that for 300 years.

Q Can you tell us how you try to do that; for example, how do you quantify the importance of clean air and clean water and lifestyle? How do you quantify those things as an economist?

A I don't have examples for those ones which you picked up, but the one that I can think of is what a person -- I was talking about per capita income earlier in the paper. The Department of Commerce which produces these statistics also produces per capita income for individual cities like for Detroit, Baltimore, Houston, and what have you, and one attempt to try and get at a quality of life indicator was just as we divide income by a price index to get real dollars, you know to eliminate the effect of inflation, these people have used an air pollution index; I think it was sulfur dioxide emission or what have you, and they have attempted to correct per capita income for differences in air pollution by dividing by an air pollution index. This was one way in which they have attempted, or we have attempted to include quality of life. It's probably one of the only real successful ones that I've seen.

Q And in more simple terms, does that mean that a number is attached to the environment?

A To one aspect of the environment.

Q One aspect of the environment.

A Sulfur dioxide emissions is the one I think it is; it might be nitrous oxide. It's been too long since high school chemistry to know exactly what emittent.

Q Is it a percentage number or is it a dollar number?

A It's probably something like parts per million.

Q I know, but when you translate it to --

A Can you divide a dollar -- Okay. Essentially what they have is, let's say, that the per capita income in New York was $10,000.00, and let's say that the per capita income in Seattle was $5,000.00, but the pollution index was twice as high in New York as it was in Seattle. So what they did was they divided this parts per million into dollars; it was indexed into dollars so that if we allow for the differences in air pollution, if we correct for this one aspect of non-monetary income, the figures may be more comparable. Is that --

Q Yes, I am just --

A So the resulting number is a dollar term.

Q Okay.

A Again just like we convert to 1958 dollars to 1967 dollars to eliminate the affect of inflation.

Q Yes. The same kind of method could also, perhaps hasn't been, but could also be applied to, for example, water pollution?

A Yes. Hopefully, but we haven't been very successful in the last 300 years like I said. But hopefully, as we get better in measuring, these so-called non-monetary benefits, as we are able to quantify them better, we will be able to include them in our index of economic well-being.

Q You're not doing that now though?

A No. We're trying, but we're not getting very far.

Q How about elbow room; could that be quantified?

A Well, you can always take persons per square mile, but you see you run into a problem there in that I think it's open to debate which way is better and which is worse. I think it's rather uncontroversial to say that less sulfur dioxide is certainly better than more sulfur dioxide. But in terms of population density, I'm not sure that one can say that, for example, higher population density is better than lower population density.

Q What you have to do then is balance that against the benefits to be derived from a higher population density; is that what you're saying?

A Well, I would say that that would be one of the last indexes that we would get around to because the question of which is better and which is worse is open to debate. Some people would like a lower population per square mile; but other people would like higher, they like the urban life.

Q How about you?

A So, you know, trying to correct for population density, which way do you correct? We don't know yet.

Q What do you like better, higher or lower?

A Well, it depends on if I'm in the mood for a musical, you know a stage show, or if I want to go fishing.

Q Do you fish?

A Yes; not very successfully, but I do fish.

Q Would it make sense to you to, in order to determine whether units 3 and 4 were beneficial to the state of Montana economically, would it make sense to you to quantify those non-monetary benefits?

A I don't think they can be quantified. Like I say, we've been trying -- I mean they involve some of the very factors, the various aspects of quality of life, lifestyle, breathing room as you say; these are the very aspects which we have been unable to quantify, which economists have been unable to put numbers to. Yes, if we could put numbers to them, they should be considered in the analysis, but I'm not --

Q But because you can't, you don't?

A That's right.

Q But you think they should be quantified and compared?

A Sure, but we haven't been able to do it so far.

MR. MELOY: I have no further questions.

HEARINGS EXAMINER: Mr. Hilley, redirect?

MR. HILLEY: Could we have a break?

HEARINGS EXAMINER: We'll take a ten minute recess.

(RECESS AT 10:40 A.M.)

Following a brief recess, the hearing reconvened at 10:50 A.M. on February 10, 1976.

CONTINUATION OF EXAMINATION OF PAUL E. POLZIN

Redirect, by International Brotherhood of Electrical Workers

By Mr. Hilley:

Q Dr. Polzin, on your cross-examination you have discussed the employment situation, however, a significant amount of that testimony has involved your own employment. Let's get into this just for a minute. Now you are hired by who?

A For this testimony?

Q Yes.

A The International Brotherhood of Electrical Workers.

Q And where do you work otherwise?

A At the Bureau of Business and Economic Research at the University of Montana.

Q Which department is this bureau affiliated with?

A We are a department in the business school.

Q How many people work in this bureau?

A Professionals?

Q Yes.

A Myself and Maxine Johnson.

Q You've indicated that you were hired by the IBEW; how does this relate to the work that you do for the Bureau of Business?

A I am on what we call a 12 month contract. In other words, I am not on an academic year contract. I more or less am required to be there eight to five every day. The work that I have done for the IBEW was done on annual leave time, on weekends and in evenings. For example, I am on vacation time right now.

Q You work under the direction of who?

A My immediate superior is Maxine Johnson.

Q To your knowledge has the IBEW also hired her?

A No.

Q In other words, it is your testimony that you were specifically hired for this project; is that right?

A That is correct.

Q You were asked about a conflict of interest situation. How do you think that this relates? In other words, Mr. Shenker has implied that there is a conflict of interest. Have you consulted with Maxine on this project at all?

A On this project, no, we have not consulted in any way.

Q So in essence what you've been doing is moonlighting on this work that you've compiled for the IBEW?

A That is correct. I have, for example, paid my own computer costs; I have paid my own secretarial costs; I have paid my own postage and things like that.

Q Other than your own employment, I think that the cross-examination has centered primarily around the maintenance of the agricultural life style. I think that both cross-examiners have gotten into this into somewhat detail. Would you mind telling, for the records, what this concept is?

A As an economist, I really cannot define life styles. I do not know how to define life styles. I do think, though, that since everybody agrees that there is a rural life style out there it must exist, even though I can't myself sit down and define it. One thing, though, I think should be kept in mind is that over the last 20 or 30 years, I only know of the last 20 years precisely, there has been extensive net out-migration from rural areas in Montana, specifically Rosebud County, Big Horn County and Powder River County. And I think some people may argue that the maintenance of this rural life style, whatever it is, however it is, is probably dependent on the successful net out-migration of these people, because if they had to remain in the rea, if sufficient jobs had to have been created in Rosebud and Big Horn County, I would think that whatever life style is, it certainly would be different now if there would be a third more jobs or 20 percent or 50 percent more jobs. In other words, quite possibly this life style has been maintained only because the rural areas have successfully exported people. They have not had to provide jobs in the local area for them.

Q Do you have any figures pertaining to precisely, or approximately, what this out-migration has been?

A I would have to refer -- the only state I have is the blue report.

Q Now, Dr. Polzin, would you identify this report that you have in your hands?

A This is a report titled "Water Use and Coal Development in Eastern Montana." It is published by the Bureau of Business and Economic Research, School of Business Administration, University of Montana at Missoula. Publication date is November, 1974.

Q Who is the author?

A Myself, Paul Polzin.

Q All right. In directing your attention to the out-migration of figures that --

A Okay. On page 20 of that report I had some data, census data, for an aggregate of three counties, Rosebud, Big Horn and Powder River County. Between 1960 and 1970, net out-migration was about 2,500. In other words, there were about 2,500 more people leaving than entering. Now, during 1970 the population of those three counties was approximately 19,000, so I am just suggesting that quite possibly the life style there might be different had the population been 2,500 higher or, in other words, had there been sufficient jobs created in the area so that these people who had to leave could have stayed and worked in the area.

Q In other words, are you suggesting that the major export there has been people?

A One of the major exports has been people, yes.

Q By exporting people, are you suggesting that this is the only way that the so-called agricultural life style has been maintained?

A I think it has been one of the major determinants of the maintenance of this life style, whatever it is.

Q Now, you are asked the question regarding railway jobs as opposed to the actual jobs that have been projected for Colstrip 3 and 4. I think in the cross-examination, if I'm not mistaken, it centered primarily around per capita income and was confined primarily to per capita income. Now my question is, is this, number one, a fair way of evaluating the value of railway jobs as opposed to Colstrip jobs, and if it is, well that's fine; if it is not, what other factors must an economist take into consideration for such an evaluation?

A Obviously it is one way in which we can compare railway jobs and electrical generation jobs. Another way a regional economist may evaluate the importance of jobs is by looking at the average income per job. Just as an example, let's say that we have two different types of primary jobs. Okay, let me go back for a minute. Regional economists usually divide a local economy into two sectors, a primary sector and a derivative sector. The primary sector is those industries which produce for export outside the area, for example, coal mining, agriculture and what have you. Derivative sectors, on the other hand, are people-serving industries, retail clerks, trades, local government and what have you. Most regional economists believe that, when we look at a small area, changes in the derivative industries are caused by changes in the primary industries. In other words, a chain of causation occurs from something happening in the primary sector; this causes a change in the derivative sector. Now, both railroad jobs and electrical jobs are primary jobs. In other words, if we add a primary job, it's going to have an impact on the derivative job. One of the determinants of the ultimate effect of a new primary job is the average earnings per primary worker. In other words, let's say we have two hypothetically different primary jobs. One is a manufacturing job paying $10,000 per year and the other is, say, a tourist oriented job paying $5,000 per year. Which of these two new jobs would have the greatest impact on Montana? I think, and based on the analysis that I've done and other people have done, that the primary job with the highest income, the new manufacturing job, would have a greater impact on Montana's economy than the new lower paying job. So when trying to evaluate the importance of a job to the area, one of the things which we should consider is the earnings per worker, the income of that job. With respect to electrical generation workers and railroad workers, I believe I stated earlier that the average earnings per job is quite close in both; they're both about $17,000 or $20,000 per year.

Q What about your multiplying factors, other concepts other than the per capita concept of primary and derivative?

A Well, this just simply means that an addition of an $18,000 primary job would have a bigger multiplying factor, would have a bigger impact on the derivative industry than an addition of another primary job which may only pay $10,000 or $5,000 per year. The multiplier would be greater for the high income primary job.

Q Then, in essence, aren't we speculating on just where the engineers and railway crews might be stationed in order to haul coal?

A That's one of the aspects, yes.

Q And without knowing that these employees would be in the state of Montana, then it would be impossible to say for certain exactly what industry, that would be railway as opposed to Colstrip, would have the greatest economic impact upon the state?

A Only if you could stipulate that all of the railroad workers are living in the state of Montana can you derive some implication concerning the impact of total numbers of workers in Colstrip 3 and 4 vis-a-vis total number of railroad workers.

Q What about other economic factors such as trade centers and these sort of factors?

A This has to do with the location of the new derivative jobs. Like I said, if we have an increase in primary employment, this is going to impact on the derivative industries. And one of the things which we really don't know right now in economics, which we're currently working on, is where these new derivative jobs would be located. Now on the basis of the research published in this blue report,"Water Use and Coal Development," I conclude that much of the impact of coal-related development in the rural areas would be felt in Billings and Miles City, the two trade areas. In other words, many of the new derivative jobs created by coal development will be in our cities. It may be a little difficult to see why that occurs, but I think if we imagine, for example, a store in Colstrip or a retail trade store in Forsyth who is supplied by a jobber or a wholesaler in Billings -- if the coal miner or electrical worker buys something from this store, this store must, in turn, turn to his wholesaler in Billings, and this is one way in which the economic impact is transferred spatially. The other way is obviously the direct shopping effect where people in Colstrip and around the mines may do some of their weekend shopping in Billings or Miles City. This is how the impact is spatially transferred from Rosebud County over to Yellowstone County and Billings.

Q Dr. Polzin, when the question was asked pertaining to the numbers on railway jobs, I presume that that implies that there will be another site for coal generation. Have you made any studies regarding where this site may be located and what would be the economic impact in the coal industry, for example, Wyoming as opposed to Montana or Washington, which I presume does not have any coal; have you made any studies on this?

A No, I have not made any detailed studies. I can, however, comment on the matter.

Q Would you?

A I think that once you pose the possibility of moving this generation plant from Colstrip that one cannot automatically assume that the coal will be shipped from Colstrip to the new generating site. This is an example which is often used in economics texts, that when one moves a facility around then the other things change. You can't just move the same facility from Colstrip to, say, Hot Springs or Spokane and assume that everything else will be the same. For example, I have read in a newspaper testimony that the Boardman Plant, or one of the Oregon utilities, ships their coal in from Wyoming. Presumably, I don't know, I have not researched it in detail, but presumably the cost of transporting the coal increases dramatically once they have to take it over the Continental Divide here in Montana. If you are looking at a site in western Montana, or more likely in eastern Washington, I think there is the possibility that it may be cheaper for the utilities to ship the coal from Wyoming up through whatever that pass is, the Snake Pass or -- I don't really know the way the railroads go, but I know it's not as steep a grade as it is going over Butte and what have you. So I think there is a very likely --

I mean it is quite likely that if we explore the possibility of alternative sites to Colstrip that you just can't assume, I don't think, that Colstrip coal will be used in these other sites. It may be, but there is, I think, the possibility of cheaper freight rates if Wyoming coal were used, or I understand there is some coal in Idaho. I don't know much about it.

Q So in order to draw the conclusions regarding these railway jobs, then we would have to have an absolute here, isn't this true, that the railway workers must be living in the state of Montana?

A Right, the railroad workers must be living in the state of Montana, and for that to be true we are probably talking about the use of Colstrip coal in alternative sites, and I don't believe that that is a sure thing. In other words, there is some uncertainty about the location of these railroad workers in Montana if we're talking about alternative sites.

Q Now, you were asked about synthetic natural gas -- I think these two words contradict each other, but synthetic gas, anyhow -- that can be utilized or substituted for natural gas. We were talking about costs and so forth. Are you familiar with any gasification plants in the United States today?

A There are, to my knowledge, no currently operational large Lurgi-type synthetic natural gas plants in operation in the United States today. I understand there may be a few small test plants, but I can't -- we're talking about the biggies, about the big Lurgi process ones and there are no operational plants today.

Q So having no big plants to get your costs from it would be impossible to compare this synthetic gas with electrical need; isn't this correct?

MR. SHENKER: I'll object to the question on the strength of the precedent set by Mr. Hilley's statement that nothing is impossible.

MR. HILLEY: Mr. Davis, we've been speculating all morning. I just want to join this club.

HEARINGS EXAMINER: I'll overrule and we'll find out. You may answer.

A I think that our data for the electrical generation industry is much harder than the data for gasification. I had to rely on a lot of assorted sources, picked up bits and pieces, to find out various aspects of gasification, and I'm quite sure that when gasification materializes some of these things are going to be different, but we do have operational electrical generation plants of this size and as I remember it, my data is much harder, much more solid for electrical generation than for gasification.

Q Simply because gasification has not been constructed on a large scale, is that correct?

A That is correct.

Q There was some reference again to maintaining this style that we keep talking about, and I think that you testified that tourism might be a contributing factor. Now, I think that you've indicated, though, that tourism did not amount to anything more than the military. When you say military, what do you really mean?

A There are, of course, many ways of comparing industry. We hear the argument about every week as to what is the most important industry in Montana, what is the second most important industry, what is the third most important industry. I believe that the best way of comparing industries -- now we're talking about primary industries, how do we compare one primary industry to the other primary industry. I think the best way to compare industries is in terms of primary earnings. In other words, which industry has the largest primary earnings, which industry has the second largest and so forth. That is where this figure of about 50 to 60 million dollars in primary earnings for the tourist industry came from. Federal military data, which has to be broken out by the department of commerce, includes Malmstrom Air Force Base; it obviously includes all military personnel in the state, but the primary one is Malmstrom Air Force Base. So essentially what I am doing is comparing the tourist industry in terms of direct primary income to the federal military industry and its primary income, and as I computed earlier, they are about the same size. In other words, in terms of the overall economic impact, the importance of tourism is roughly the same as the federal military.

Q Or primarily Malmstrom Air Force Base?

A That's the major installation in the state; it also includes the recruiters out in Billings and the ROTC people at the university, but the primary military installation is Malmstrom.

A Now, also in cross-examination, I think that when we talk about jobs, that's quite general. In fact, I don't think it has been clarified. What is the significance of quantity of jobs versus quality of jobs?

A One example when we are talking about quality of jobs is the impact on the derivative industries per primary worker. This has to do with that multiplier effect we were talking about earlier. The higher the income of the new primary job, the greater will be its total impact on the local economy. That is one measure of the quality of job. Another way we can measure quality of job, which is a little bit more subjective, is in terms of things like average hours per week; is it a full-time job or is it a part-time job; is it a seasonal job or is it a non-seasonal job, things like that. And this, as I say, is a little bit more subjective because some people may like a part-time job; some people may like a seasonal job because it fits into their way of life, but it is one way of evaluating quality of job. Again, I hate to keep coming back to the tourist industry, but it does provide several good examples in that we may have, say -- the average tourist job, when we are talking about a gas station attendant, or a retail trade clerk, or a bartender, may be part-time, it may be seasonal, and in addition it may be low paying. On the other hand, good attributes would be a primary job which is high paying, non-seasonal, in other words it does not shut down during the winter or certain times during the year, and full-time involving 40 hours per week or thereabouts. And on these counts I would rank electrical generation and coal mining as being quite high quality jobs.

Q Would you explain for the record precisely what is this multiplying factor that we've been discussing?

A Okay. If we have a one-unit increase in the primary industries, for example, if we add one more job in manufacturing, or if we add one more coal mining job, how many new derivative jobs would that create? And again this is not a solid number; it depends on a number of factors. The multiplier depends first of all on the earnings of that new primary job. But some rough guesses which I present in my testimony are, for example, that 500 new manufacturing jobs that pay $10,000 would create about 870 additional derivative jobs. In other words, there would be about 1.5 new derivative jobs for every increase in primary jobs. This is the multiplier that we're talking about. It's the number of new derivative jobs per new primary job. If we increase primary employment by one, how many new trade and services jobs would there be?

Q This takes us back, then, and bears directly upon the quantity and quality concept doesn't it?

A Yes.

Q Take this life style in agriculture, is that a quantitative job or a qualitative job?

A We would have to look at some of the characteristics of agricultural employment and I do not have this data in front of me. I will have to, as best as I can, recollect from the census of agriculture and what have you, and I'm now speaking of the average agricultural job in Montana. You have to remember that agriculture in Montana is very different, depending on where you are. On one hand it can be the wheat farmer in the Golden Triangle, it can be the cattle rancher down in the Colstrip area, or it could be the very small rancher down in the western part of the state. But in terms of overall averages, the income per worker in agriculture is quite high relative to the non-agricultural sector. This is primarily because we do have some very profitable and some very well run ranches in some parts of the state. On the other hand, we find that the earnings per worker in agriculture is very variable; it depends on the price of wheat. During good years, agricultural earnings are very high; during bad years agricultural earnings are very low. Also, if we look at the trend in agricultural employment, and I think I do that in the testimony, we find that the number of agricultural jobs, regardless of their quality, has declined significantly in Montana. In my table 1.5 on page 16, agricultural employment was 53,000 in 1950; by 1970 that had declined to 36,000. In other words, there's a decline of almost 15,000 jobs in agriculture statewide. If we look at specific areas in the state, some areas that decline has been greater than others. In other words, agriculture is not really a growth potential industry in number of workers. It does have high earnings per worker in some years, but in other years earnings per worker in agriculture is very low. Agriculture is seasonal. We think of the farm owner as being on the job all of the time, but if we look at hired farm employment, the non-owner, we find that is very, very seasonal, primarily during the summer and during the good years. So in terms of these indices of job quality, namely earnings, seasonality, cyclical nature, what have you, I would think agriculture is relative, how good is it, how bad is it; I don't really know, but there are some aspects that are questionable in agriculture.

Q Now, in your report you've concluded there would be a minimum job gap of 17,500 people, and that would be in the next four years --

A That would be cumulative over the entire decade.

Q All right. You have been asked the question regarding what are we going to do? My question, I guess is, is it your position that in order to maintain this so-called life style, are we going to have to export 17,500 more Montanans from the state?

A That's a very difficult question to come to either conclusion to. I think that, at least in my opinion, it does seem quite obvious that in the past maintenance of the rural life style was dependent on significant out-migration. In other words, I think that rural areas would be significantly different today, life styles would be significantly different, if sufficient jobs were created in these areas for all the people who did leave. When we get into statewide, it becomes a little more difficult because you're talking about the difference between urban and rural areas within the state. Life styles, even though I can't define it, I would be willing to bet are different in Billings than they are in Rosebud County. And so I think it's rather difficult to talk about a Montana life style; I think the best that you can do is talk about rural life styles in Montana and what have you. But I would think that, we're now talking about rural areas, if rural areas were required to provide job opportunities for all the young people who are entering working age, that this may have a very significant impact on the maintenance of their life style.

Q Also, on the concluding note in your report, you took some hypothetical industries and you speculated, based upon the tables and the figures that you have drawn in the first and second part of the statement, as to what it would take to fill this job gap that we're faced with. The industries that you chose for hypothetical industries are basically primary jobs; isn't this correct?

A They are all primary industries.

Q Why did you use primary industries to fill this minimum job gap?

A As I testified earlier, economists believe that growth in an area, or change in an area, is induced by the primary sector. In other words, if you want to change or increase employment in an area, you do so by creating new primary jobs and this, then, would have an additional impact on the derivative sector. So when we try to identify areas to stimulate, we look at primary areas and if we are successful and able to stimulate primary industries the effect on the derivative industries will follow.

Q Dr. Polzin, you previously identified what you call a blue book, I believe, but in any event I am now showing you IBEW's proposed Exhibit number 1. I believe you have already identified it, but for the record perhaps you should go ahead and re-identify it?

A This is a report in a blue cover called "Water Use and Coal Development in Eastern Montana" written by myself, published by the Bureau of Business and Economic Research, School of Business Administration, University of Montana, Missoula.

Q Did you compile these documents in conjunction with anyone?

A It represents a lot of research, and while I'm the author, I was the primary researcher on it, there were a number of people involved, both as my assistants and as colleagues. It's my report, it has my name on it, I am responsible for it.

Q And when was this proposed IBEW Exhibit number 1 -- when was this finally drafted and published?

A The publication date is November, 1974.

Q MR. HILLEY: To which the IBEW will offer its proposed Exhibit number 1 into evidence.

MR. SHENKER: No objection.

MR. MELOY: No objection.

HEARINGS EXAMINER: Very well, IBEW number 1 will be admitted. Mr. Hilley, it has been our rule here that whoever offers an exhibit has to furnish nine copies, so I guess you'll take care of that.

MR. HILLEY: We will furnish it, Mr. Hearings Officer.

Q In summary, Dr. Polzin, is it your testimony that the creation of Colstrip 3 and 4 is not a panacea for all of the ills and the economic condition of the state?

A That is correct. It is simply not big enough by itself to turn the state around, but then again there is no other one single project which I think is big enough to solve Montana's employment problems. If Montana's employment problems are to be solved there would not be one big item, but a number of little items. If sufficient jobs are to be created for those entering the labor force, it's going to have to take the coordination of a number of projects to do so.

Q Then, in your opinion, is it true that available power is more likely to create jobs?

MR. SHENKER: I think I'm going to object to that question until I find out more likely than what?

HEARINGS EXAMINER: I think the objection is well taken; would you clarify that for us?

Q All right. Does available power, as opposed to a shortage of power, lend itself in a climate more conducive to creating jobs?

A There are a number of factors which enter into the location decision of industries and firms. The availability of power is, of course, one of them. And those firms which would use a lot of electrical power, if we would have excess power in Montana, Montana would hold some relative attraction to those industries which use a lot of power. I have to qualify myself there in that we in regional economics are not yet good enough to be able to precisely predict which industries will locate where. We can identify general factors which do effect industry location, and so I would modify that slightly by saying that if sufficient power, or if excess power, or if electricity were available in Montana, this would act as a relative inducement for some industries to locate in Montana. Whether or not they actually do depends on many other factors. The availability of electricity, though, is one factor which may entice industry.

Q Wouldn't it then follow that a shortage in other parts of these United States might be conducive for, say, some further growth, or increase that factor in economic growth?

A Well, we're talking about the relative availability of electricity. If the rest of the United States, for example, is terribly short of electricity and we have some excess, this would act as a relative inducement for industries to locate here, industries which think electricity is important. There are only some industries which use electricity. But it would act as a relative inducement for industrial location in Montana.

Q Now taking your figure of the minimum job gap of 17,500, if Colstrip was constructed, then I believe that, according to the testimony, this would perhaps be reduced to, say, 17,400, correct?

A Well no, we would also have to take into account the derivative jobs which would be created by Colstrip 3 and 4. As a rough guess -- whenever we estimate the multiplier we have to look at the very specific case involved, but as a rough guess, let's say two new derivative jobs were created for each primary job. So if we had 100 electrical generation workers, we would have an additional 200 derivative workers. So that would mean that the total impact of Colstrip 3 and 4, excluding the miners, would be about 300 new jobs in the state of Montana. Now these are rough, these are very rough, because as I said earlier, the multiplier depends on the specific case when we look at it; it is very hard to generalize. So that would reduce it from 17,500 to 17,200.

MR. HILLEY: No further questions.

HEARINGS EXAMINER: Very well. We will have re-cross testimony.

Re-cross, by Department of Natural Resources and Conservation

By Mr. Shenker:

Q The factor of the availability of electrical generated power, Dr. Polzin, is one that we examined on your cross-examination. That didn't seem to do the job in the historical period for which you have comfortable data?

A Well, during its historic -- I phrased it -- what I just said was that the relative availability of electricity in Montana would act as an inducement. During the period 1950 through 1970, power was apprently available throughout the United States. Again, I want to emphasize it's the relative availability of power, not the absolute availability of power.

Q And if you look to the west, from Montana, power is cheaper than it is in Montana; isn't that true?

A I have read that.

Q Yes. So given the availability of power west and here, one would expect industry to flock to the cheaper power rather than here?

A Those industries which use electricity.

Q Now, Dr. Polzin, if what you're looking for is sort of a comparative advantage on the availability of power, you wouldn't want to export the power out of Montana, you'd want to keep it here for availability on attractiveness to industry; isn't that right?

A Yes.

Q As I understand your testimony, Colstrip 3 and 4 isn't the panacea and there isn't any panacea that you can find for Montana job development, right?

A No one solution.

Q But some panaceas are better than others; that is to say, some little chipping away at the block may be resulting in more of a chip than others?

A That is correct.

Q For example, when you have 350 jobs versus 95 jobs, 350 jobs is more of a chip than 95 jobs would be; isn't that true?

A If the other factors are equal, if their incomes are equal.

Q Right. Well, a little bit more about this bureau that you work with, not the Better Business Bureau, it's a bureau for better businesses. The Bureau of Business and Economic Research consists of you and Maxine Johnson, right?

A That is correct.

Q And she's the boss?

A That is correct. She is the director.

Q How many people from rural settings will work on the permanent jobs created by Colstrip 3 and 4?

A I don't know.

Q You commented, Dr. Polzin, on Mr. Hilley's presumption that there was no coal in Washington. Didn't you know that there is coal in Washington that is powering some electrical generating stations there?

A Yes, I do know that. There is also some coal in Idaho. I don't know whether this coal in Idaho is being used for anything.

Q I wondered, if you did not correct Mr. Hilley's presumption on that, but you looked at the Boardman Plant of the Portland General Electric Company's sponsorship, and noted that they were to get coal from AMAX. Do you understand that AMAX in Gillette, Wyoming has a contract with Portland General Electric Company to supply them coal over the life of the plant?

A I did not know that, but it makes sense.

Q What would you think about the fact that they don't have such a contract?

A Well it sounds as though the electric company is keeping its options open.

Q Precisely. As a matter of fact PGE is still itself exploring for coal which PGE will either own or lease. Now that would be intelligent planning, too, wouldn't it?

A PGE?

Q Portland General Electric Company, one of the applicants in this proceeding.

A Right, okay.

Q That would be intelligent planning for the utility to keep its options open, right?

A Yes.

Q You commented to Mr. Hilley on the use of Colstrip coal, noting that there may not be a direct equivalence between the coal used to fire generating stations at Colstrip, Montana and the coal that would be shipped out from Colstrip to fire generating stations elsewhere, but you told Mr. Meloy, of course, that you don't expect that the coal will sit in the ground if it can't be used for firing the generating station at Colstrip. Have you considered, Dr. Polzin, the availability of a coal supply in Colstrip, Montana to move east or south, as opposed to load center generating stations in the Pacific Northwest?

A Yes, that's a very interesting question. If you look at individual sales, it is very hard to predict who is going to get what. For example, we've got that stuff from Decker going down to Texas, but yet I don't really think Texas is part of our market area. Based on the study done by Cameron Engineers, and it seems to make pretty good sense, it looks as though our long market area is probably the upper midwest, say, if you draw a line from Milwaukee and Madison across, that area north seems to be our market area for coal. If you go south of that, first of all you run into competition from the midwest sources because that's obviously closer, but if you're looking for low sulphur coal, then you run into competition from Wyoming because this is the way the rail lines run.

Q Then you have competition, which you've discussed in IBEW Exhibit number 1, from other states, which depends upon the legislation by other states and the nature of the industry and its structure in the other states as well?

A Yes.

Q You talked with Mr. Hilley some about quality versus quantity of jobs. What other good quality jobs are there besides 95 workers at the Colstrip units 3 and 4?

A What other good quality jobs associated with 3 and 4?

Q No, other than those 95 folks who could work at Colstrip 3 and 4, if those plants were built, what other good quality jobs are there anyplace in Montana?

A The university isn't too bad.

Q Okay. That's got something of a multiplier, too, doesn't it?

A Well, it depends. If you look at the state as a whole, universities are derivative jobs.

HEARINGS EXAMINER: Hearings examiners.

MR. SHENKER: That's quantity.

A This, as a matter of fact, is one of the reasons why we examined this in the Montana economic study. And if we do look at Montana's primary industries, wood products, agriculture, mining, I mean metal mining now, historical primary industries, and you compare them on these quality indices, even though any one individual may not consider it good or bad, our primary industries don't stack up very well. I mean like wood products, it's seasonal. It's relatively high income but it's seasonal.

Q What are the good quality ones? You told me that railroading was about as good as coal generating plants --

A Railroad is good, noncyclical, nonseasonal --

Q Does something other than railroading have good quality?

A I think the refining jobs weren't too bad when they existed. To the best of my recollection they were relatively well paying and they were somewhat cyclical because of the demand for raw material, but they weren't seasonal in the sense that they would shut down for a couple of months every year. Federal employment, that's the great one; federal jobs are good. They're high paying, they're definitely noncyclical, they're nonseasonal.

Q And they do multiply?

A And they do multiply, yes, internally and externally.

Q By geometric rates sometimes.

A Sometimes.

Q Now as to relatively equal quality jobs like railroading and mine-mouth generating plants operating, you wouldn't make a value judgment on one quality being better than another quality would you?

A The word quality sort of has a bad connotation. These are ways of evaluating attributes of these jobs, you know, their income, seasonality and what have you. Some people may not like mining, and so while I would consider it to be a high quality job in terms of its regional impact, he may not like it because of his own personal tastes. So keeping in mind that we are not talking about an individual's evaluation of whether it's high quality or low quality, but simply evaluating its impact on the economy, then -- your question was?

Q You sometimes lose it sometimes.

A I know, I get carried away.

Q The question was whether you'd place a value judgment upon the relatively equal quality jobs within your frame of reference?

A No, I do not.

MR. SHENKER. Nothing further.

HEARINGS EXAMINER: Mr. Meloy.

Re-cross, by Northern Cheyenne Tribe, Inc.

By Mr. Meloy:

Q Dr. Polzin, on redirect you told Mr. Hilley again that the operation of units 3 and 4 were not big enough to make a difference in terms of the economic picture, but that we needed a number of those small projects; is that correct?

A Yes, Colstrip units 3 and 4 by itself will not turn the economy around.

Q And when you were talking about bigness and smallness, you were talking about employment, weren't you?

A Yes.

Q You were certainly not talking about the project itself?

A As to whether or not it's a big project or a little project?

Q As opposed to whether it's a big generating station or a small generating station.

A In terms of its electrical output?

Q Yes.

A No, I'm only talking about its employment impact.

Q Do you know of any bigger electrical generation stations in operation in this country?

A There may be; I don't know.

Q But it is a big one in terms of electrical generation?

A Yes, I know it is big, but I don't know if there are any bigger ones or not.

Q It's also bigger in terms of quantity of sulfur dioxide that it produces; it's also bigger in terms of the quantity of water that it uses?

HEARINGS EXAMINER: Was that a question?

MR. SHENKER: Yes.

HEARINGS EXAMINER. Put a question mark after it then, and then you can answer.

A I really can't answer about sulfur dioxide and things like that. I'm not --

Q Do you think it's a small plant in terms of employment?

A Well, it's a small project within the context of the problem that we are looking at. The problem is a job gap of 17,000 and within that context, the number of jobs created by 3 and 4 is small, yes.

Q But it is big in comparison to other generating stations?

MR. HILLEY: Objection. The witness has already testified that he doesn't know. This is very repetitious.

HEARINGS EXAMINER: I think it's a little repetitious, but I'll overrule. You may answer. You may answer the question if you know.

A To the best of my knowledge, yes, it is a big plant.

Q You told Mr. Hilley on redirect that among the primary industries the agricultural industry in Montana did not have much growth potential, but that strip mining and power plants do have high growth potential; is that right?

A In terms of agricultural employment, in terms of number of new agricultural jobs, I don't think agriculture is very promising. In terms of the potential increase of new jobs due to strip mining, I think that is promising. So if you are measuring in terms of employment potential, I would agree with your statement.

Q I think you told Mr. Shenker on his re-cross that it depends on tastes when one makes a statement about quality of jobs?

A No, I'm saying that as a professional, as a regional economist, I would evaluate jobs in certain ways. For example, what I call high quality jobs were evaluated in my professional way. Whether or not you like that job as an individual, whether or not you felt it was high quality from your point of view did not enter into my ranking of whether or not it was a high quality or low quality job.

Q When you are talking about high quality jobs, then you are talking about industries that have the potential of growing?

A And they are high income, low cyclical, nonseasonal and full time. Those are the four dimensions in which I was measuring quality.

Q Then if you had the opportunity to determine the direction in which the state of Montana would go, because agriculture has a low growth potential and, therefore, a low quality job --

A No. What I said was that because of the nature of agriculture, I don't look for many new agricultural jobs to be created in Montana, so it's low quality. I measure quality on the basis of income per worker, seasonality, cyclical nature and full time. I did not use the probability of whether or not it would increase or decrease as being a measure of high quality or low quality. For example, we can have very high quality jobs like railroads, excluding coal mining, which have a very bad future for Montana. The railroad emplcyment in Montana has just dropped dramatically in the last 20 years as we eliminated the passenger services, as we automated the switch yards. So in other words, we have a very high quality type of job, a railroad job, but outside of unit trains, outside of shipment of coal, it's not a very promising industry. So my index of quality does not include whether or not there will be significant growth in that industry.

Q But you keep coming back to what is a promising industry when you are talking about quality; you just did it?

A Obviously we would like to find -- if we were trying to eliminate that job gap, we would obviously want to fill it with, first, an industry which is likely to grow, and second would be a high quality industry. So the two are associated. I mean if we are trying to find what is the best way of helping Montana, we would obviously not look at an industry which doesn't have much future.

Q Okay, let's look at an industry such as generating power. What aspects of growth potential do you see from certification of 3 and 4?

A For certification of 3 and 4?

Q Let's assume that 3 and 4 are certified and are operating. Now you told me that there is great growth potential among power plants. What growth potential might stem from 3 and 4?

A Do you mean what developments will occur in addition to 3 and 4?

Q Yes.

A I don't anticipate much because we looked at that northcentral power study and that identified 22 sites, and this was sort of a figure that people have kept in the back of their minds. Conditions have changed since the northcentral power study; the relative price of electricity has gone up. This has decreased the rate of increase in the demand for electricity. So it's very difficult to say will one new plant open up or will two new plants, or will no new plants, but I think that the idea that we're going to have wall-to-wall generating plants in eastern Montana, as per the northcentral power study, is very unlikely.

Q But then power plants are not good from your standpoint unless we have a number of them, because the growth potential from one is practically nil?

A Well, if you're looking at one that you want to evaluate the impact of a project, we're going to evaluate the impact of a project, Colstrip 3 and 4, all right. On the other hand we're searching for promising industries with which we can try and stimulate the economy. All right, these are two very separate questions. On the one hand is a project analysis, what is the impact of Colstrip 3 and 4, and on the other hand is some sort of economic development strategy, what kinds of industries should we try and stimulate in Montana to fill the job gap.

Q Well, again I ask you the same question which you haven't answered. What potential do you see from the development and the construction and the operation of units 3 and 4 at Colstrip?

A In terms of its overall impact on the state, very small.

Q Then it doesn't have high growth potential?

A In terms of new primary jobs, no.

Q Well, in terms of the economics of the state?

A Well, I think if you wanted to go over to another area which is even more difficult, taxes, it might have a very significant impact on the state. But that's a whole another story.

MR. MELOY: I have no further questions, Mr. Davis.

HEARINGS EXAMINER: Anything further, Mr. Hilley?

Re-redirect by International Brotherhood of Electrical Workers

By Mr. Hilley:

Q You were asked about railroads and so forth and so on, about its being a primary job. I think my question would be directed to maybe some other primary jobs such as truck driving, freighting of goods; that would be another primary?

A Right.

Q What about construction?

A I think there are two types of construction, one which is primary and one which isn't primary. Residential construction and most commercial building, such as when you put up a new Safeway or when you construct something for an existing population, I would classify those as derivative. In other words, we are putting up new houses for residents; we are building new stores for residents. On the other hand we have heavy construction, for example, highway construction financed by federal funds; we have the Libby Dam and obviously we have the construction of Colstrip 3 and 4. These types of construction jobs, I think, are obviously primary or basic jobs. In other words, they will have a multiplier effect on the economy.

Q So when we were talking about the minimum job gap of 17,500 and the maintenance thereafter of Colstrip 3 and 4, we got it down to 17,300, and during the period of construction then that gap could even lessen to 16,000; is this correct?

A Yes, it could. But I have to emphasize that the estimation of the multiplier depends on the specific project. I would have to look at the specific construction work associated with Colstrip in order to estimate their impact on the derivative industries.

Q And this you have not done?

A This I have not done.

MR. HILLEY: No further questions.

HEARINGS EXAMINER: Mr. Shenker.

MR. SHENKER: You may let Dr. Polzin go home.

HEARINGS EXAMINER: Mr. Meloy, are you agreeable with that?

MR. MELOY: I'm agreeable.

HEARINGS EXAMINER: Thank you, Dr. Polzin. We'll stand in recess until 1:00 P.M.

(WITNESS EXCUSED)

(RECESS AT 11:55 A.M.)

The hearing was reconvened at 1:15 P.M., following the lunch recess.

Appearances in addition to those indicated at the morning session were Mr. Leo Graybill, Jr., and Mr. Gregory Warner, appearing for the Northern Plains Resource Council.

HEARINGS EXAMINER: Is Mr. Williams your next witness?

MR. HILLEY: Yes. The IBEW will call Mr. Williams to the stand.

RUSSELL WILLIAMS, called as a witness by the International Brotherhood of Electrical Workers, having been first duly sworn upon his oath, was examined and testified as follows:

(THE WRITTEN DIRECT TESTIMONY OF MR. RUSSELL WILLIAMS WAS DIRECTED TO BE INSERTED AT THIS POINT.)

STATE OF MONTANA

BEFORE THE BOARD OF

NATURAL RESOURCES AND CONSERVATION

IN THE MATTER OF THE PUBLIC HEARING ON)
WAIVERS AND THE APPLICATION FOR CERTIFICATE)
OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC)
NEED FOR THE PROPOSED COLSTRIP PROJECT,)
UNITS 3 & 4, WHEREIN THE APPLICANTS FOR)
SAID WAIVERS AND APPLICATION ARE PUGET SOUND)
POWER & LIGHT COMPANY, PORTLAND GENERAL)
ELECTRIC COMPANY, WASHINGTON WATER POWER)
COMPANY, PACIFIC POWER & LIGHT COMPANY, AND)
THE MONTANA POWER COMPANY.)

STATEMENT OF TESTIMONY OF RUSSELL WILLIAMS

Submitted on behalf of
INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS

HILLEY & LORING
Attorneys at Law
1713 Tenth Avenue South
Great Falls, Montana 59405

STATEMENT OF TESTIMONY OF RUSSELL WILLIAMS

I am Russell Williams, International Representative of the International Brotherhood of Electrical Workers. My home address is 3021 Harvard Avenue, Butte, Montana 59701, phone 406-792-6508. My office address is P.O. Box 1998, Billings, MT 59101, phone 406-245-6191.

I have been an International Representative for the last eighteen years, serving primarily in Montana but with various assignments in such neighboring states as Utah, Colorado, Idaho and Wyoming, as well as assignments on the national staff. Prior to that I served four years as Business Agent for IBEW Local 65 in Butte, Montana; that Local has line construction jurisdiction. I have assisted in negotiating collective bargaining contracts for both inside and outside electricians throughout the Rocky Mountain area. I participate, with other International Representatives, in two regional utility conferences each year sponsored by the IBEW Department of Research, dealing directly with employment and unemployment in our industry and the problems of utility construction.

I come out of the industry. I am a journeyman lineman, having completed four years of apprenticeship, and I spent some nine years in line construction throughout Montana and with the telephone company in the western part of the state.

Through my work for the IBEW I am in constant touch with the various locals in the state and with other International Representatives regarding the placement of our unemployed members.

I have prepared some tables which show the numbers of people on our out of work lists and the relatively small numbers of individuals we are able to place on jobs in Montana. Those out of work lists are the total numbers of men who have registered for work on our various books. For example, Book 1 lists those journeymen who have passed the necessary state examinations, have at least four years in the trade, and have worked under a local contract for the past year, that is, the unemployed local residents. Book 2 has those meeting the above requirements who come from outside the local area. Book 3 is those without four years experience and Book 4 is for all others. While it is possible for the combined figures to include non-local people, it is very rare for them to include anyone from outside Montana. Jobs are so scarce here that our electricians are going out of state themselves to seek work; journeymen electricians are not moving into Montana.

Listed below is a month by month account of those on the "Out of Work" list in the Missoula area:

	Out of Work	Referred Out
January	21	3
February	23	6
March	25	5
April	31	3
May	36	6
June	32	3
July	30	8
August	29	6
September	21	5
October	20	4
November	26	8
December	18	0

These are all inside wiremen; there are no linemen in the Missoula Local. This shows that over the last year there have been an average of 26 unemployed men each month. There are some 66 wiremen presently employed, or a total of 92 eligible for work. Therefore, over 28% of our people in the Missoula area are unemployed.

Listed below is the monthly account of those on the comparable list in Kalispell:

1975 - WIREMAN:

On Books	Month	Referred
30	January 75	13
26	Feburary	15
29	March	12
31	April	5
23	May	6
24	June	6
25	July	4
30	August	5
31	September	2
29	October	9
16	November	0
16	December	0

1975 - LINEMAN:

27	January 75	0
26	February	1
29	March	4
31	April	3
33	May	3
30	June	4
25	July	4
27	August	1
53	September	19
46	October	12
31	November	0
26	December	0

This shows an average of 26 wiremen and 32 linemen out of work each month. There are approximately 100 currently working in both categories, or approximately 158 available for work. Therefore, over 36% of our people in the Kalispell area are unemployed.

In Butte, Local #623 has 31 men on their out of work list and has been unable to refer any to jobs since November 1, 197[illegible]. This Local consists of inside wiremen and has 107 employed members, a total of 138 available for work, of whom almost 23% are unemployed.

The Butte lineman's Local, number 44, currently has 93 on the out-of-work list. That Local was able to refer only four jobs since December 1, 1975. The Local's Business Manager, Gordon Mahood, knows of some 55 additional IBEW members in the Butte area who are unemployed but not registered on the Local's out-of-work list. That Local has 194 members working, a total of 287 available for work; over 32% are unemployed.

In Bozeman there are 14 or 15 unemployed electricians; about 30% of our membership.

In Great Falls there are 12 currently on the out-of-work list, about 10% of the membership.

Naturally, the construction and operation of Colstrip #3 and #4 has a more direct effect in the eastern part of the state. Peter Lombardozzi, the Business Manager of IBEW Local 532 in Billings, had expected to be here to testify, but has suffered a severe heart attack and is presently recuperating from open heart surgery. Prior to his illness the Southeastern Montana Building and Construction Trades Council and the Yellowstone Valley Central Labor Council authorized Mr. Lombardozzi to testify on their behalf in support of the construction of Colstrip #3 and #4. Their letters are attached to my statement.

Mr. Lombardozzi contacted a number of the local unions in the Billings area to secure information regarding the effect the Colstrip development has had and would have on employment in the various crafts. The Boilermakers placed approximately 734 men on Colstrip #1 and #2, about half of them from Montana and half from out of state. Without Colstrip some of their members would probably have had to leave the state to secure work in their trade.

Construction of Colstrip #1 and #2 has meant about 150 additional jobs for Carpenters' Local 1172. This was an increase of some 40% over the 365 carpenter jobs existing in the Local's eleven county jurisdiction prior to the construction of units #1 and #2. Some 95% of the carpenters employed at Colstrip are from the eastern part of the state and about half the millwrights are from Montana. Construction of units #3 and #4 will create more employment for Montana's carpenters.

Over the last five years there have been about 100 year around jobs for members of Local 708 of the International Association of Bridge, Structural and Ornamental Iron Workers in the Billings area. Construction of Colstrip #1 and #2 increased the number of jobs tremendously; there were some 200 ironworkers in the early months of 1975 and about 100 last summer. About 95% of these were from Montana. Currently there are only 20 or 30 ironworkers employed at Colstrip and the unemployment in that craft is the highest it has been in many years. If units #3 and #4 are built, the Ironworkers would add about 15 apprentices and 15 trainees each year, which would mean that some 100 individuals would gain ironworker skills in the next three to five years. Without Colstrip construction, the Ironworkers estimate that at least half their members would be unemployed and training programs would not be increased.

The Sheet Metal Workers report that Colstrip #1 and #2 meant an increase of 50 jobs directly and some 75 if indirect increase in jobs is included. That union has been able to begin training new apprentices in their trade only because of the impact of the Colstrip projects.

Plumbers Local 30 reports that normally a large number of their members have to travel to other areas to seek employment, but during the construction of Colstrip #1 and #2 all plumbers who wished to work in the area could find employment. During earlier stages of construction the plumbers had 350 people employed at Colstrip, but now that the construction phases are close to completion, the latest figures available show 84 plumbers and pipe fitters there. Of these, there are over 60 registered apprentices, learning the trade. Prior to the construction of Colstrip #1 and #2 the Plumbers Local had less than half as many apprentices. During the construction of units #1 and #2, the plumbers enjoyed full employment for the first time in seven years.

As for electricians, during the construction phases of Colstrip #1 and #2 all journeymen wiremen from Montana who might have sought work on the project could have been placed there. In May of 1975 there were 315 electrical construction personnel on the Colstrip project; of these, 140 were from Montana.

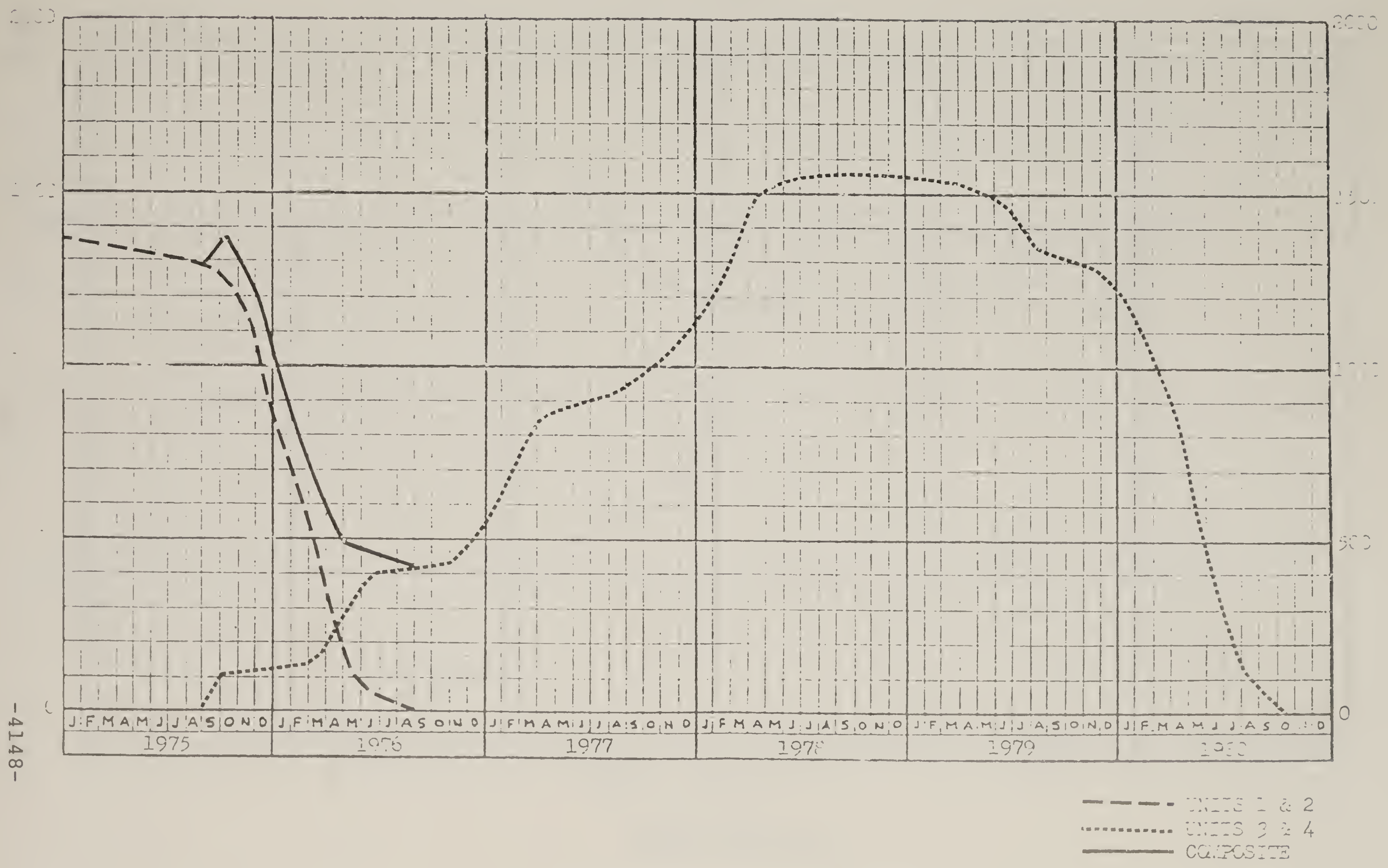
The construction of Colstrip #1 and #2 meant jobs for Montanans; there have been relatively few out-of-state craftsmen working there. Estimates supplied to the IBEW show that 85% of the ironworkers were from Montana, 98% of the laborers, 98% of the carpenters, 80% of the plumbers, 50% of the boilermakers, and 80% to 90% of the teamsters, bricklayers, sheetmetal workers, and painters. Construction of units #3 and #4 would mean similar opportunities for Montana's construction trades.

In addition to the jobs available during the construction of Colstrip units, there will be permanent jobs for electricians. There are presently 65 electricians (members of IBEW Local 44) who are permanent employees of Montana Power at Colstrip, operating units #1 and #2 as they go on the line. Almost all of these are new hires, not transfers from other areas of the company's operation, so the total employment of electricians has increased. There would be approximately 70 similar new permanent positions for electricians operating Colstrip #3 and #4.

Interrogatories submitted to the IBEW repeatedly inquired about our "planning" for Colstrip. The IBEW is a union, not a planning consultant. Employers do the planning; the IBEW and other labor organizations attempt to supply the workers which the employers will need. At our request, Bechtel Power Corporation, the prime construction contractor at Colstrip, has supplied us with graphs which show their manpower forecasts for Colstrip #3 and #4 for electricians, pipefitters, boilermakers, ironworkers, carpenters, laborers, operating engineers and other crafts. These are reproduced on pages 9 through 18.

The IBEW is as concerned as other Montanans that a clean environment be maintained. Montana's Board of Health has given conditional permission for the construction of Colstrip #3 and #4, based on the expert testimony that the state's water and air standards can be met. The IBEW did not participate in those hearings for we lack expertise in that area. Only if the state's pollution standards are met, do we support construction of units #3 and #4. Since the Board of Health has determined that it is environmentally safe to permit Montana Power to start construction on Colstrip #3 and #4, we support this project for it will mean significant additional employment, crucial to Montana's economy.

TOTAL MANPOWER FORECAST

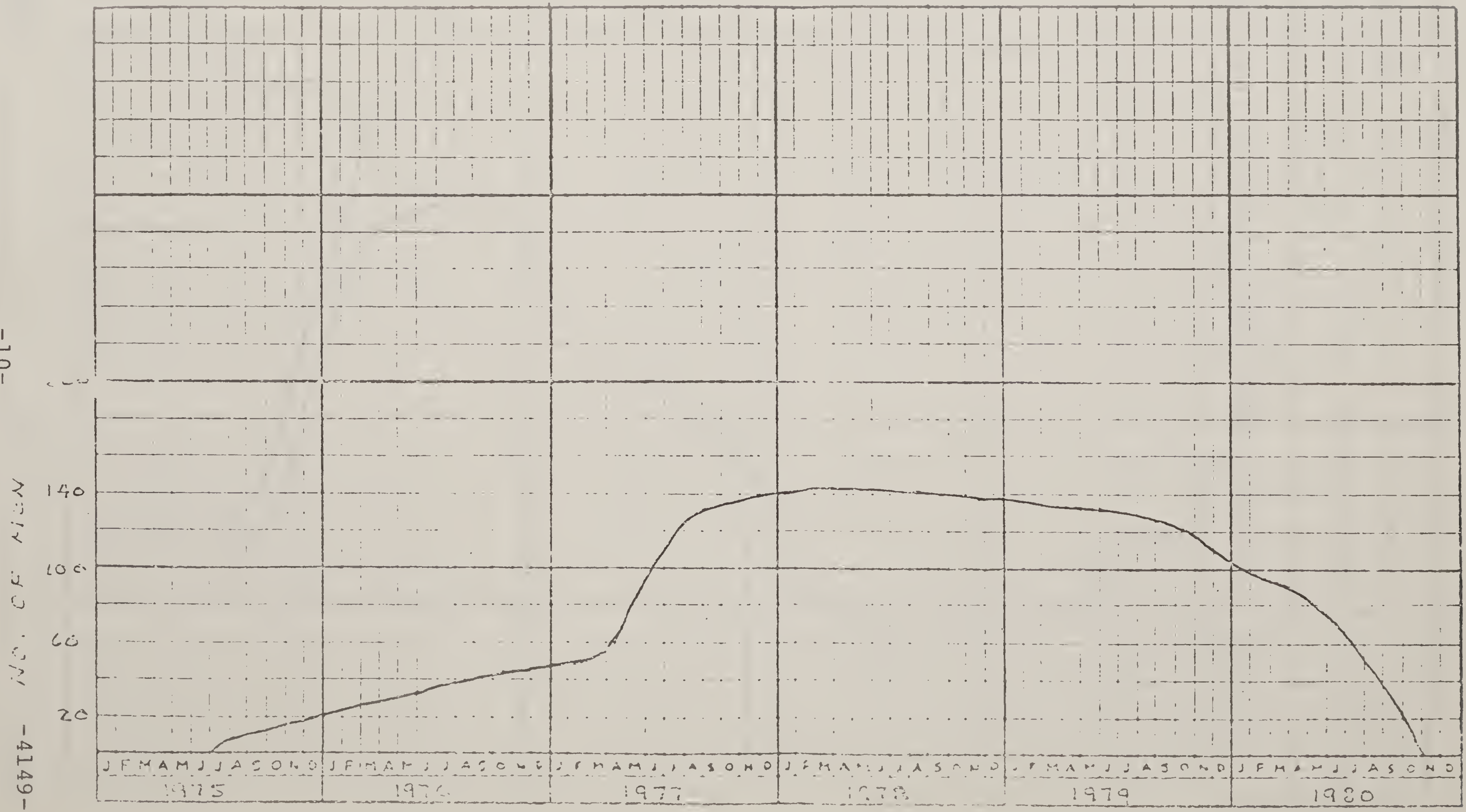


2-28-75

MANPOWER LOADING FORECAST

NON-MANUAL

Unit 3&4



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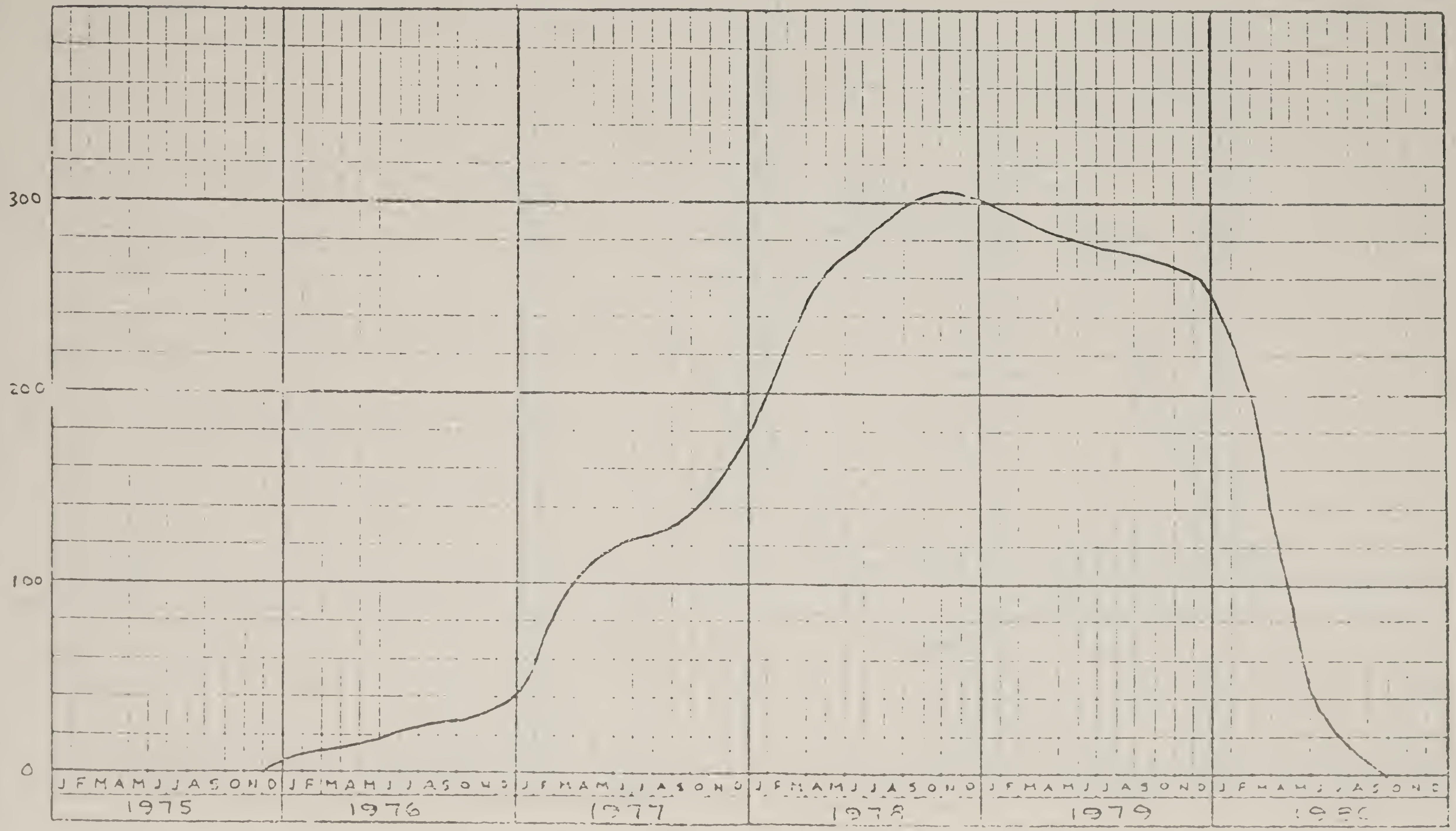
MANPOWER LOADING FORECAST

ELECTRICIAN

Unit 3 & 4

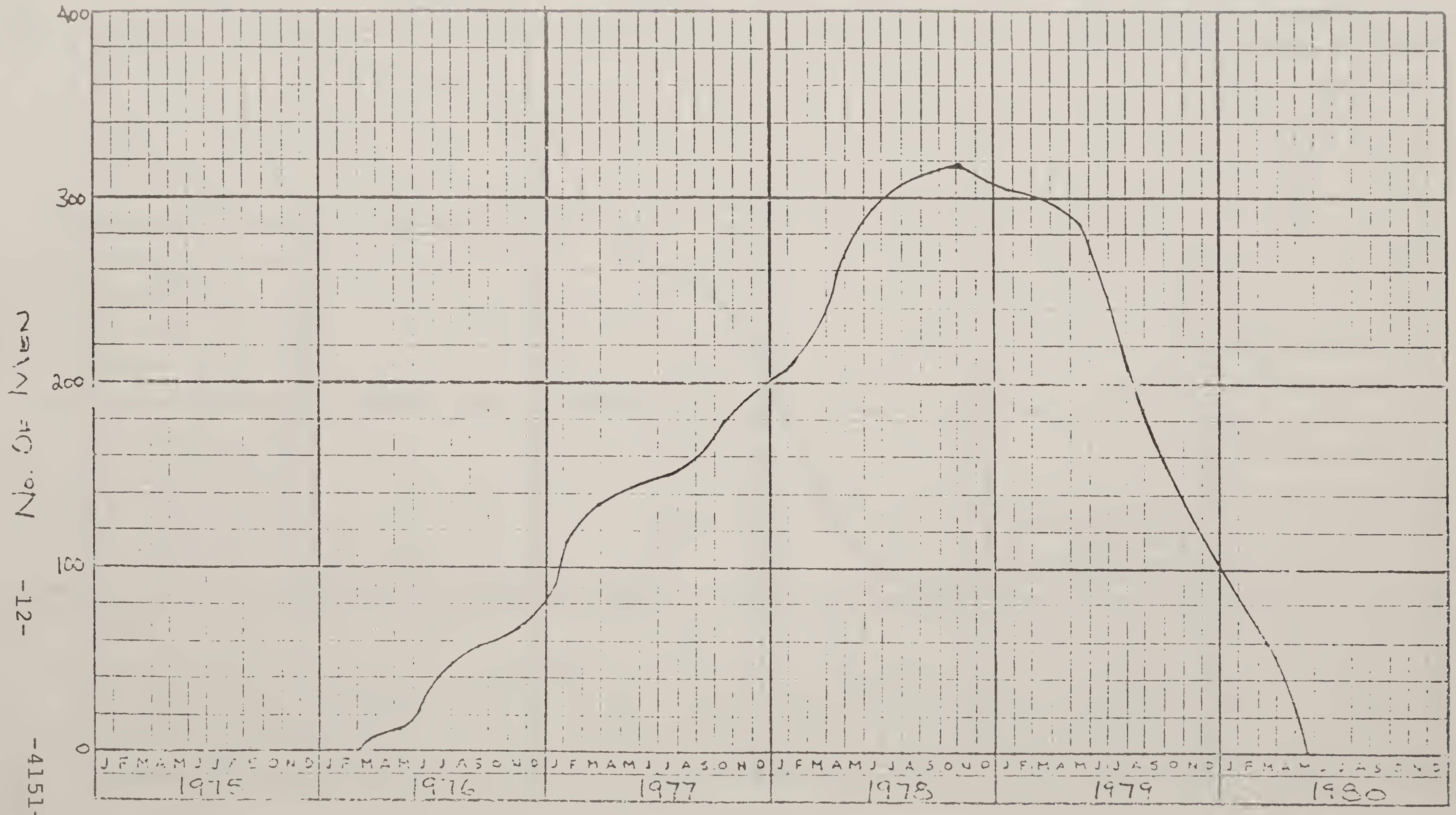


2-25-75

MANPOWER LOADING FORECAST

PIPEFITTERS

Unit 3 & 4



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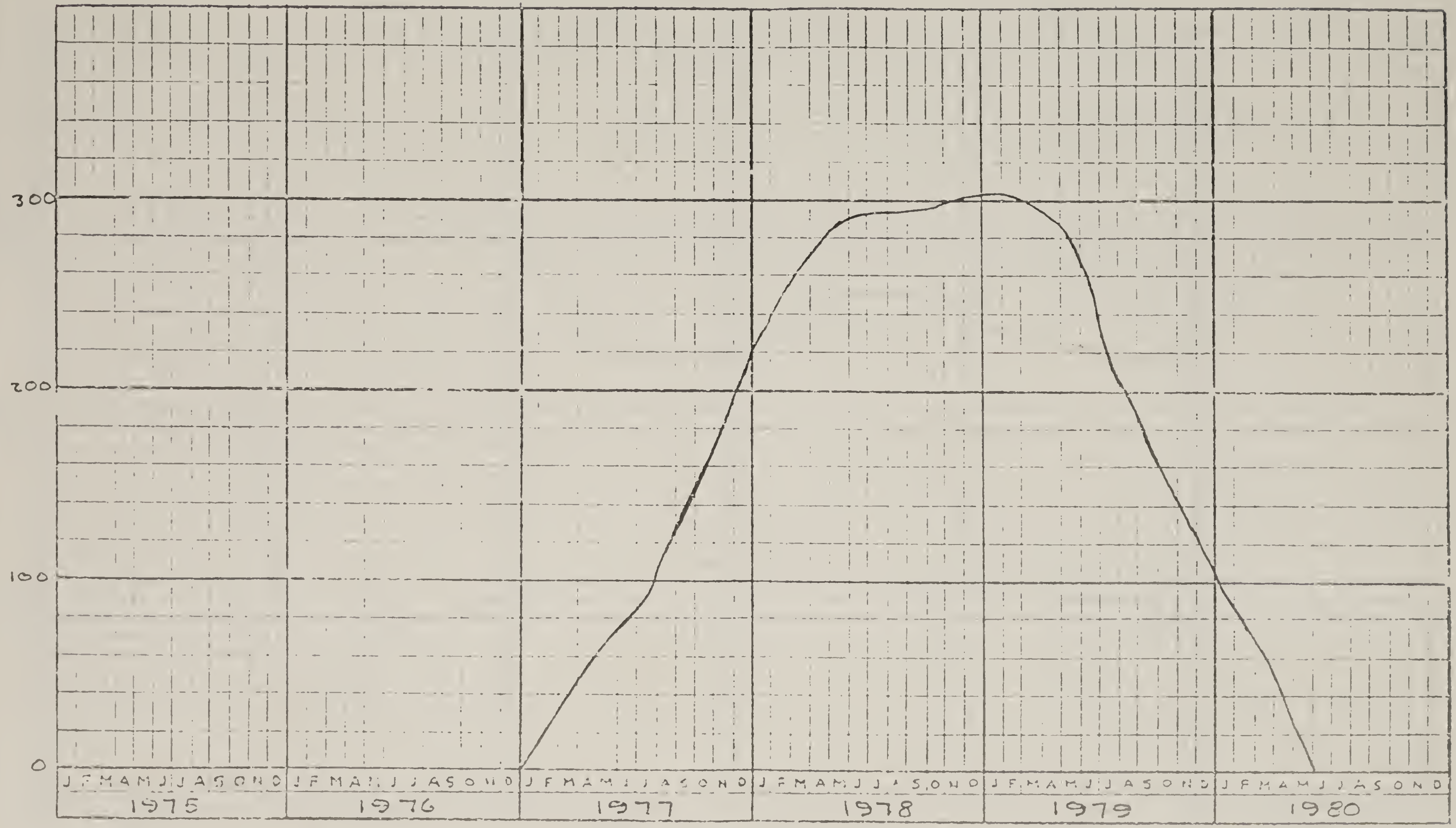
MANPOWER LOADING FORECAST

BOILERMAKERS

Unit 3 & 4



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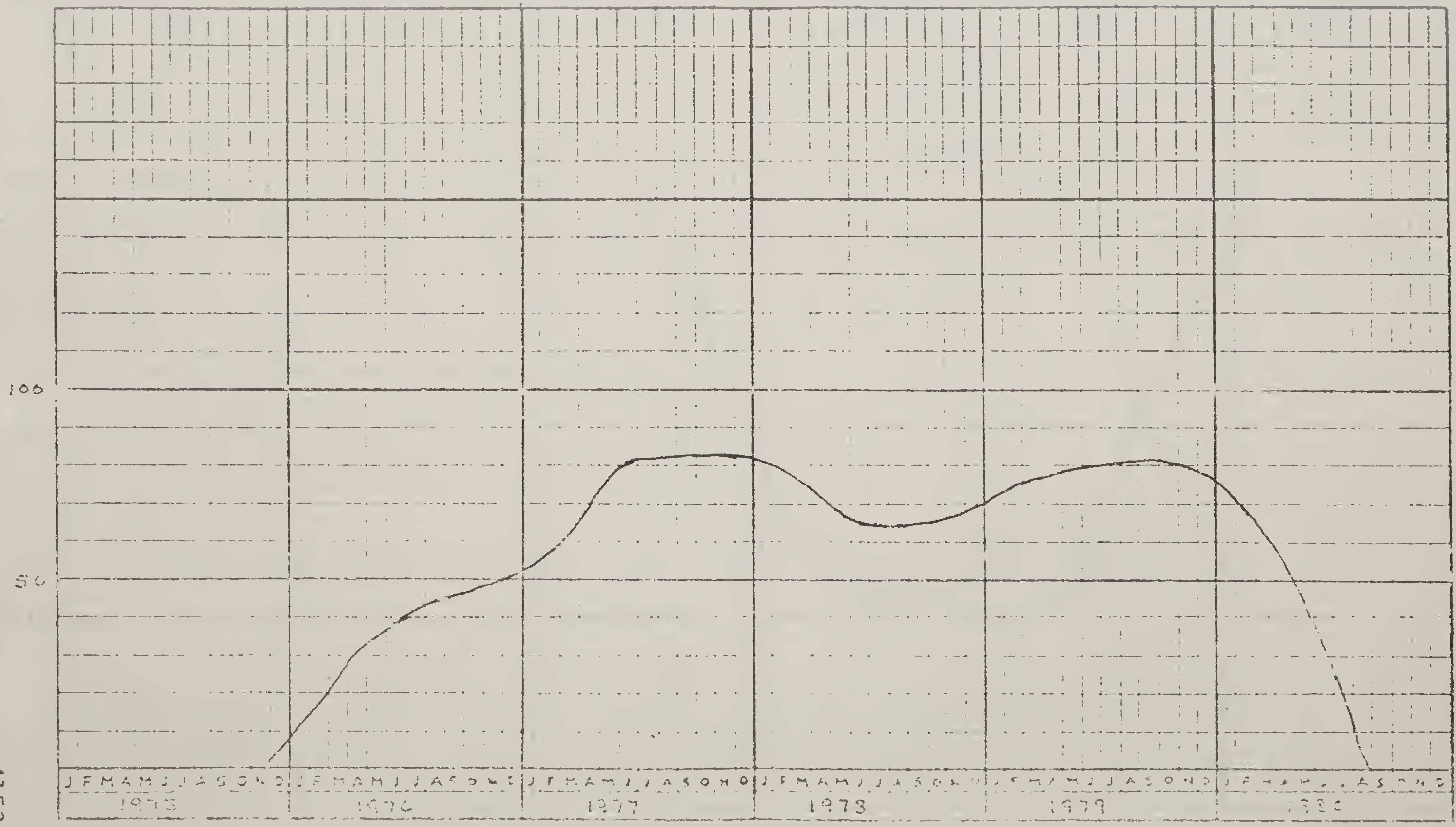
MANPOWER LOADING FORECAST

IRONWORKERS

Unit 3 & 4



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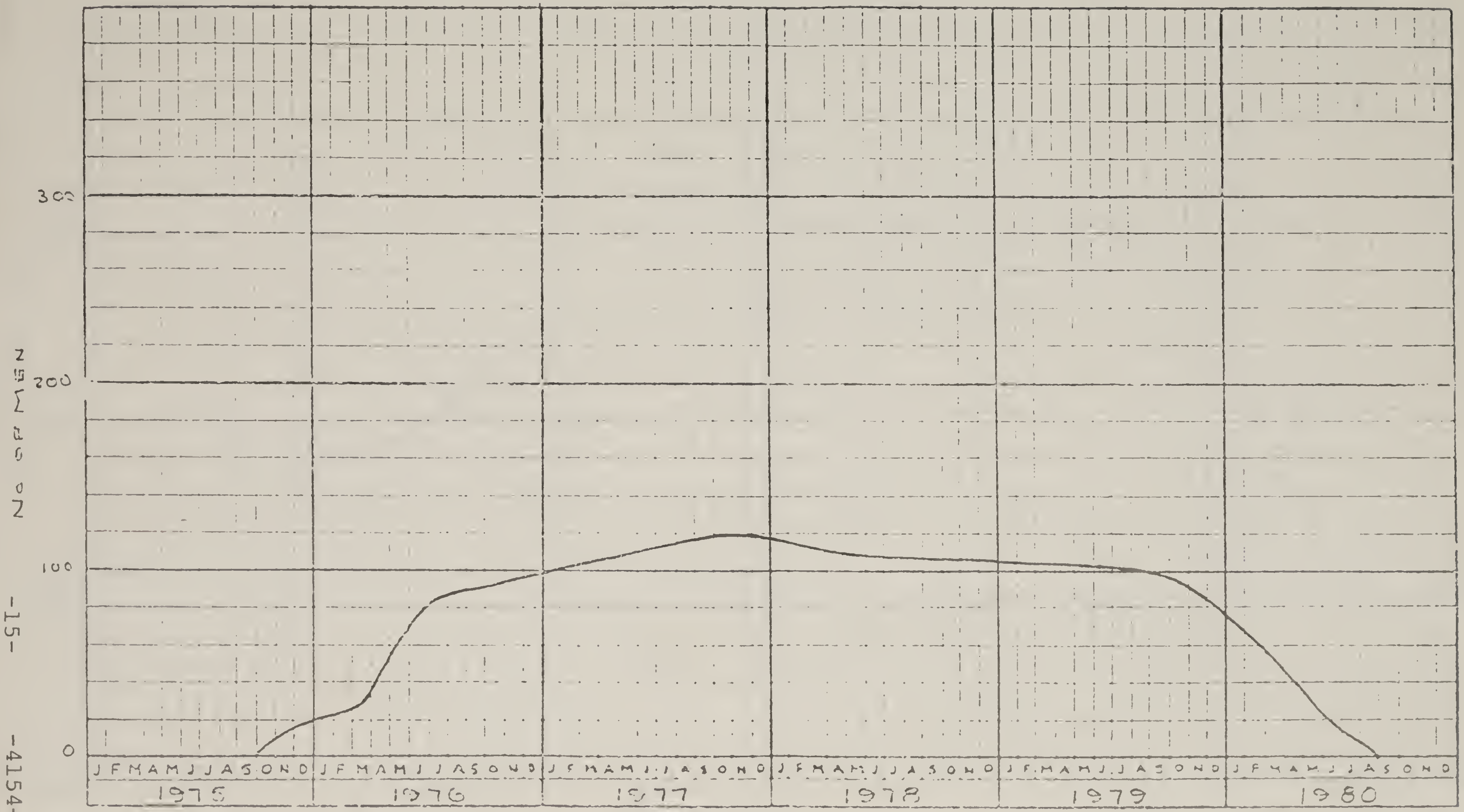
MANPOWER LOADING FORECAST

CARPENTERS

Unit 3 & 4



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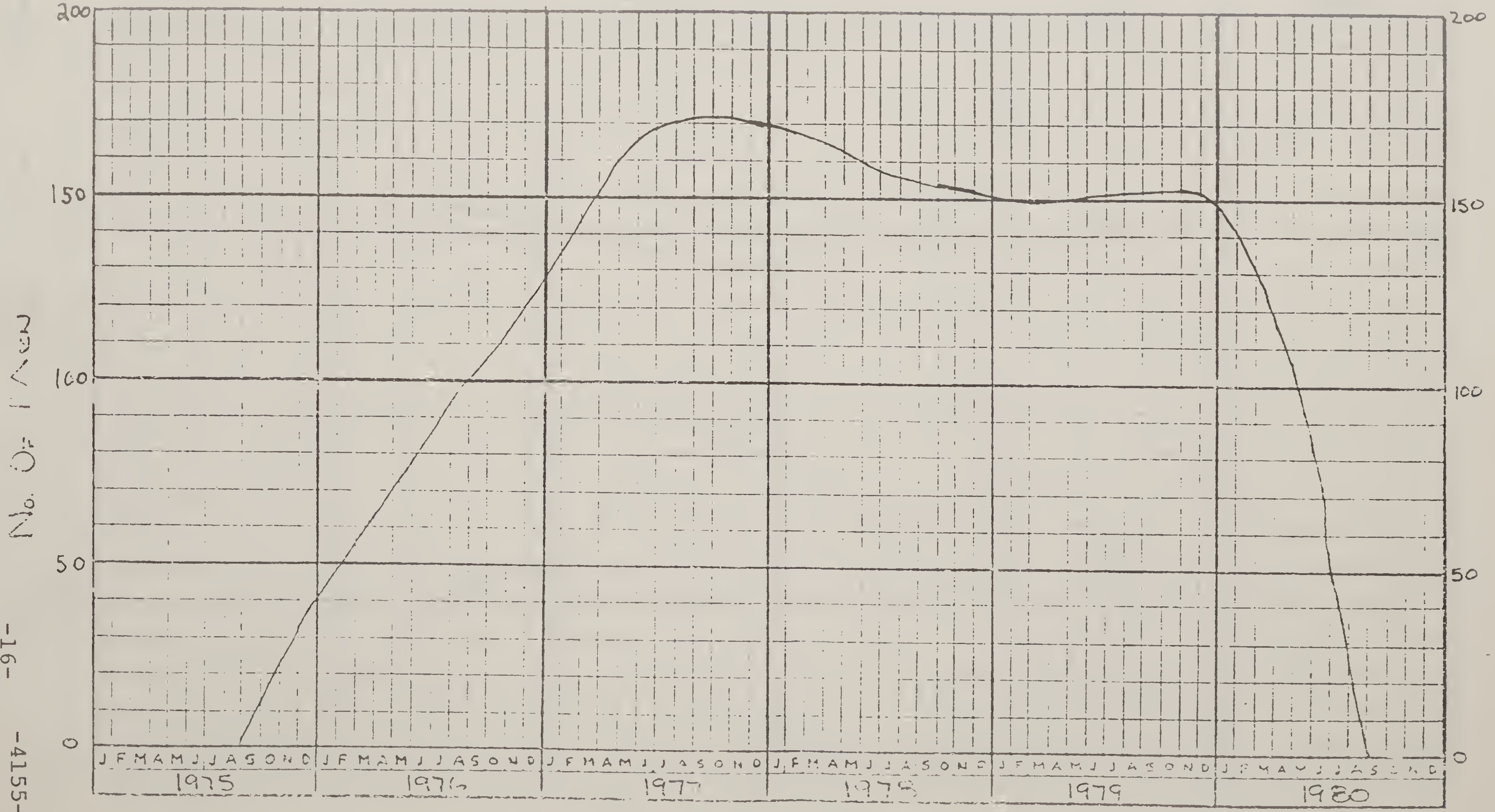
MANPOWER LOADING FORECAST

LABORERS

Unit 3 & 4

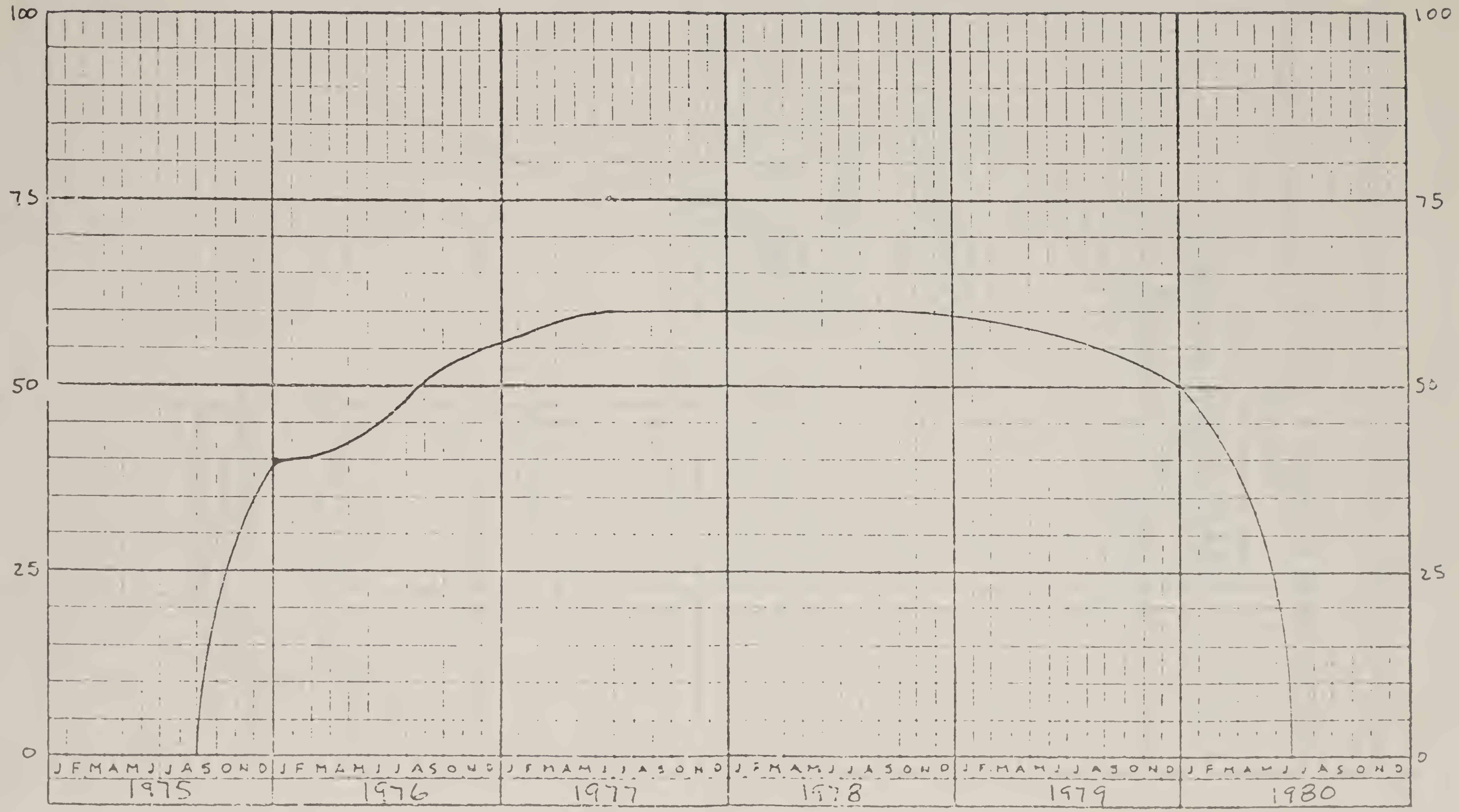


2-23-75

MANPOWER LOADING FORECAST

OPERATING ENGINEERS

Unit 3 & 4

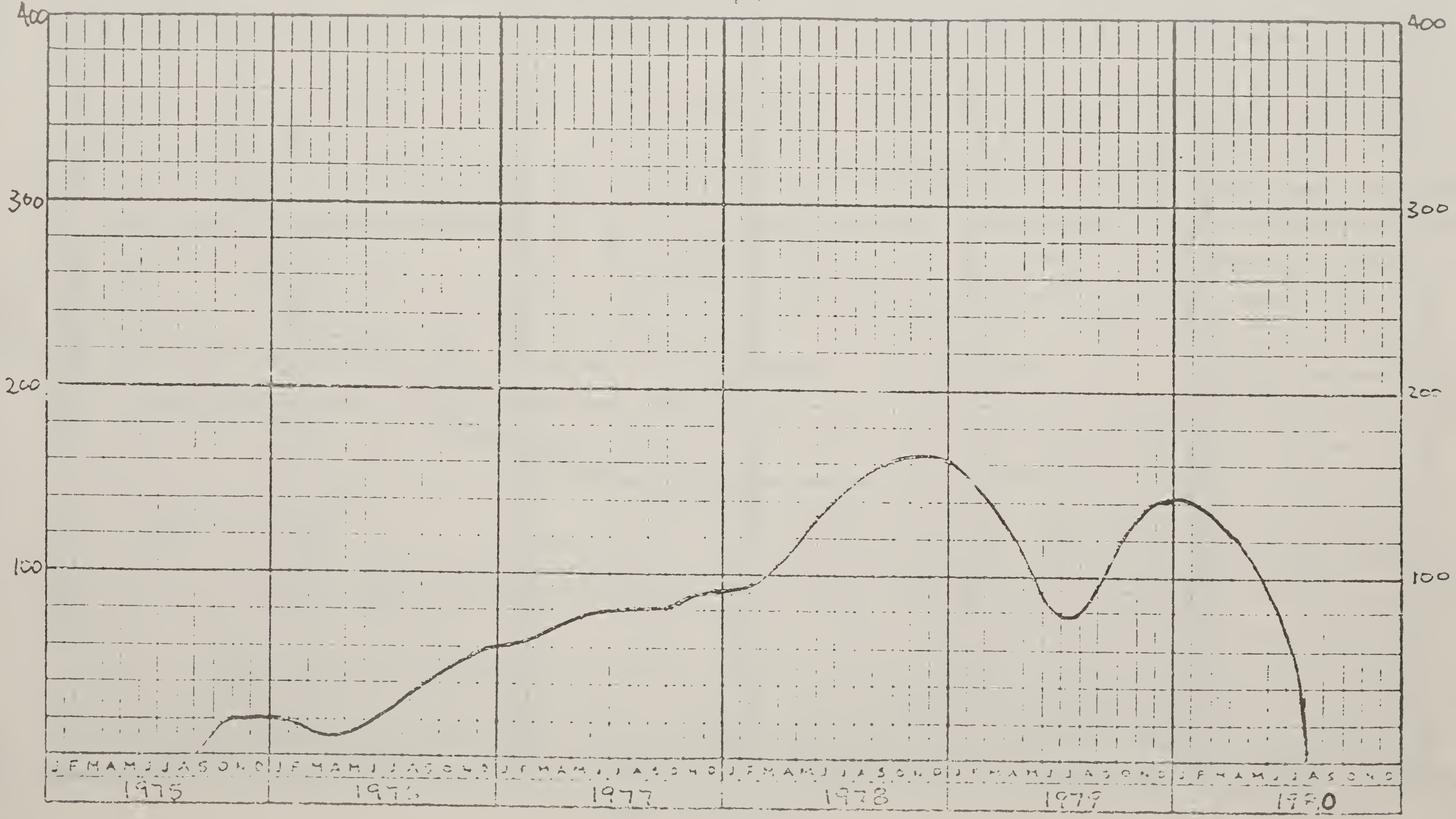


2/28/75

MANPOWER LOADING FORECAST

OTHER CRAFTS

Unit 3 & 4



7/28/75

Yellowstone Valley Central Labor Council
LABOR TEMPLE
Twenty-Four South Twenty-Ninth Street
Billings, Montana 59101

August 12, 1975

Pete Lombardozzi
Electricians Local Union #532
21 South 29 Street
Billings, Montana 59101

Dear Brother Lombardozzi:

At the regular metting of the Yellowstone Valley Central Labor Council held August 1, 1975, it was regularly moved and adopted to grant authorization to you to speak on our behalf in support and favor of the construction of Colstrip Plants 3 and 4.

Fraternally yours,

Francis E. Maroncelli
President

William [illegible] Notary
8-15-75

NOTARY PUBLIC for the State of Montana
Residing at Billings, Montana
My commission Expires August 8, 1977

SOUTHEASTERN MONTANA
~~BILLINGS~~ BUILDING & CONSTRUCTION TRADES COUNCIL
IN AFFILIATION WITH
BUILDING & CONSTRUCTION TRADES DEPARTMENT AFL-CIO
24 SOUTH 29TH STREET BILLINGS, MONTANA 59101

August 7, 1975

Mr. Peter Lombardozzi:

At our regular scheduled meeting held August 4, 1975 the delegates passed a motion to authorize you to testify and/or speak in behalf of the Southeastern Montana Building & Construction Trades Council in support of constructing Colstrip Units # 3 & 4 before the hearings currently being held in Montana.

For anyone's information, the Southeastern Montana Building & Construction Trades Council represents 3500 members.

Fraternally,
SOUTHEASTERN MONTANA BUILDING & CONSTRUTION TRADES COUNCIL

Bill McCalley, President

Albert White, Secretary

HEARINGS EXAMINER: Mr. Shenker, do you wish to cross-examine?

MR. SHENKER: Thank you, Mr. Davis.

EXAMINATION OF RUSSELL WILLIAMS

Cross, by Department of Natural Resources and Conservation

By Mr. Shenker:

Q Mr. Williams, in your capacity with the IBEW, sir, have you been involved with negotiations for contracts with employers?

A Yes, I do.

Q Have you had any involvement with the Montana Power Company over the years?

A Yes, I have.

Q Have you, in fact, been a principal negotiator for the union in connection with the Montana Power Company?

A On occasions.

Q When did you first know that you might come to testify as a witness in these proceedings?

A When the IBEW decided to intervene.

Q When was that?

A When we first heard about the question of the building of Colstrip 3 and 4.

Q How long before that time have you had any personal contact with any representative of the Montana Power Company?

A Concerning what?

Q Anything.

A Well, I've talked to them on grievance procedures and -- oh, some little items that were before the legislature over the years that we had a common interest in.

Q You talked to them almost every day?

A No.

Q Every week?

A No.

Q Every month?

A No.

Q Well, how long before you, with the IBEW, decided to intervene in the Colstrip proceeding, had you had any contact with the Montana Power Company on any subject?

A Well, to my best recollection, probably three or four months.

Q At any time, Mr. Williams, prior to the decision of the IBEW to intervene in this proceeding, had you had any discussion with any representative of the Montana Power Company on the Colstrip units 3 and 4?

A No.

Q Never had it discussed?

A You're saying until we decided or before we decided?

Q Before you decided.

A I didn't, myself, no.

Q Is it your understanding, Mr. Williams, that no representative of the IBEW had made any contact with any representative of the Montana Power Company regarding the Colstrip units 3 and 4 prior to the time that the IBEW decided to intervene in these proceedings?

A It could have possibly been brought up in discussions with some of the various business agents.

Q Mr. Williams, how did you find out about the Colstrip proceedings and your right to intervene in them?

A I found out about the Colstrip proceedings first of all, when I read about it in the paper.

Q And after you read about it in the paper, without ever talking to any representative of the Montana Power Company, you decided it would be a good thing for the IBEW to intervene?

A We in the IBEW decided that in the best interests of the IBEW people we represent, it would be.

Q And there was no contact with the Montana Power Company prior to that decision?

A No.

Q I take it, Mr. Williams, you want this Board of Natural Resources to believe that there had been no discussion on the advisability of the IBEW entering these proceedings as an intervener, between representatives of the applicants to the proceeding and representatives of the IBEW?

A We acted on our own.

Q That's what you want the Board of Natural Resources to believe, as I just stated?

A That's just exactly what I'm saying.

Q Now, Mr. Williams, so that our record is clear, of course you are not speaking on behalf of any labor union other than the IBEW, is that correct?

A No, that's correct.

Q Is there a union that folks who work on railroads belong to?

A We have local unions that we represent that have agreements with various railroads.

Q What's the name of the union for which railroad workers would belong?

A Well, they could belong to the IBEW.

Q Any others?

A Locomotive Engineers.

Q Any others?

A Pullman Porters.

Q Any others?

A Breakmen.

Q Have you sampled the views of the representatives of those unions which you just mentioned as to the Colstrip proceedings?

A No.

Q And can you tell me, Mr. Williams, whether you have contacted any of the railroad workmen members of the IBEW personally, to determine their views on Colstrip?

A No, I have not.

Q Has anyone on behalf of IBEW made such contact?

A The International President, when he entered on the proclamation in favor of building generator plants, I assume that he contacted the Vice-President and told him what the position was going to be.

Q You assume that the President contacted the Vice-President, but I'm asking you if anyone contacted the original workmen who are railroad men and belong to the IBEW. Do you know the answer to that question?

A I do not.

Q That's interesting, as you just described it to me. The International President handed down the decision and told the

Vice-Presidents what the decision was going to be. Is that the process by which the decisions get made?

A On some occasions.

Q That's the way this decision got made?

A Yes.

Q Has the IBEW ever taken a vote on what the views of the members would be on Colstrip?

A No.

Q No?

A No.

Q A straw poll, maybe?

A No.

Q Questionnaire?

A No.

Q You have attached to your statement, Mr. Williams, some projections made by the Bechtel Power Corporation on manpower forecasts. I take it that you, personally, have no ability to tell us whether Bechtel did a good job or a bad job with their forecasts?

A I think it was very accurate.

Q Whom did you contact personally at Bechtel in order to see how well they would do their job?

A How well they did their job?

Q Sure.

A Well, the figures that are shown on the charts are employment figures and these correspond somewhat -- very closely -- to the figures we had from the various organizations that show how many people from the various crafts worked on 1 and 2.

Q I do understand you correctly, don't I, Mr. Williams, that it was Bechtel who supplied those figures?

A There is no question about it.

Q Who from Bechtel supplied the figures?

A The one that we contacted was Mr. Jim Waldon.

Q Did you have any contact with Bechtel out of their San Francisco headquarters?

A No.

Q Did you have any contact with anyone from Bechtel other than Jim Waldon?

A No.

Q Will you turn to page 8 of your statement, please, Mr. Williams? At line 2 of that statement, you say: "Since the Board of Health has determined that it is environmentally safe to permit Montana Power Company to start construction on 3 and 4 -- " Who told you to say that?

A Nobody.

Q What makes you think that the Board of Health said that it was environmentally safe?

A Maybe I should have used the word "safe," but that's the one that's there.

Q That's all your language, I take it?

A Yes.

Q Do you know what the Board of Health's function was as far as its certificate in the Colstrip proceedings is concerned?

A As far as I know, it was to determine if they were going to meet the standards of the Clean Air Act.

Q And the Clean Water Act and the federal equivalents and the state implementation plans. It's all set forth in the statutes of the Major Facility Siting Act, isn't it?

A I believe so.

Q Have you read that statute?

A Not in its entirety.

Q As I read your conclusion, Mr. Williams, beginning at the bottom of page 7, you state that "only if the state's pollution standards are met, do we support construction of units 3 and 4." Would I infer from that, sir, that what you give at this time, therefore, is conditional support to the Colstrip units?

A How do you mean, conditional?

Q Well, the condition is that those pollution standards have to be met, or you won't support the Colstrip construction, is that right?

A We feel that if they meet all the standards of the law, then they should be built, to provide work for our people.

Q What if the standards are not met?

A If they're not met, they shouldn't be built.

Q What if they're built and it's found that the standards are not met?

A I haven't got into that.

Q Got any thoughts on it for us?

A Not at this time.

Q You state, Mr. Williams, in the conclusion of your written, prepared testimony, that the Colstrip project will bring significant additional employment crucial to Montana's economy?

A Very definitely.

Q You were here when Dr. Polzin was testifying, were you not?

A Yes.

Q You don't disagree with him, do you, as to the crucial role that Colstrip employment brings to Montana?

A No, I don't disagree with him.

Q How do you feel about having some -- a greater amount of employment brought to Montana than through 95 permanent jobs at the Colstrip units 3 and 4?

A I'd like to see more jobs for the people in the state of Montana. I'd rather see the jobs in Montana than out.

Q If I were to tell you, Mr. Williams, and ask you to assume as correct, that there would be 350 jobs provided in the state of Montana, without Colstrip 3 and 4, but not benefiting solely the IBEW members, as compared to having 95 jobs provided with the Colstrip units 3 and 4, and benefiting the IBEW, which alternative would you urge upon this Board of Natural Resources?

A Well, first of all, we're here concerning the building of Colstrip 3 and 4 and what it means to the IBEW, but on the other hand, we also feel that the economy of the state of Montana needs a boost, and whatever we can do to stimulate that boost, we're here to see that it's done. Now, if it's comparing it between apples and oranges, as far as I'm concerned, if it will get a job here that will stimulate other jobs in other industries, this is fine, but as far as we're concerned, if we can get Colstrip 3 and 4 and have available power, we hope, if we don't represent the people and someone else does, that the jobs are available.

Q Well, let's compare 350 oranges with 95 oranges, Mr. Williams. Which would you prefer between the two?

A If you're saying -- well, I don't think we're really concerned with what union represents the people. We're concerned with the jobs.

Q That's very nice, sir; yet, in the interrogatories which you signed for these proceedings, it was your view that the alternative of shipping coal by unit train didn't provide any work for your members. Do you recall that?

A Yes.

Q You don't want to change that interrogatory answer now, do you?

A The interrogatory asked, I believe, if we had a position on shipping coal out of the state.

Q And your answer was, "None, except that it constitutes no work for our members."

A That's right.

Q You don't want to change that answer, do you?

A No.

Q Are you aware of the fact, Mr. Williams, that under the Montana Utility Siting Act, this Board of Natural Resources and Conservation is charged with the requirement of evaluating the alternatives to the proposal submitted?

A I believe so.

Q And on that subject, alternatives, I take it the position of the IBEW is that you have made no studies, no analyses, no evaluations, no calculations, no tests and determinations to aid this Board in looking at alternatives?

A Every time I go to a union meeting and see most of the people sitting on one side of the hall that don't have a job, that's a determination for me.

Q On the subject of alternatives, sir?

A Yes. What other alternative do they have if they don't have work? Starve?

Q Have you thought about working in some other place than at Colstrip 3 and 4 in generating stations?

A We have tried, but there are no other jobs right now, either.

Q Well, then, we should really set about the task of finding the greatest number of jobs, whether these happen to be in Colstrip, Montana, or not, shouldn't we?

A If we can find jobs, that's what we're trying to do.

Q Back to the question I asked you, Mr. Williams, it is the case, is it not, that the IBEW has made no analyses, no evaluations, no calculations, no tests and determinations to the alternatives to the proposal submitted for Colstrip 3 and 4?

A The only analysis we made, and again, I repeat myself, is that we know the unemployment that our members are suffering, and the analysis is that we have to have something to get them gainfully employed, and one of the things that we have found out is that the most jobs that have been available have been the building of Colstrip 1 and 2, for example, and Libby Dam and the powerhouse in conjunction with it.

Q In construction jobs?

A And as a result of the construction jobs, there are permanent jobs.

Q How many permanent jobs were created by the Libby Dam job?

A Well, right now, there are just a little over 56 people up there working permanently.

Q And 95 out of Colstrip 3 and 4, together?

A Right now, we don't have 95 people there.

Q That would be for Colstrip 3 and 4, not yet built -- of course, you couldn't have them there, but that's what is projected on Colstrip 3 and 4, right?

A Well, the figures that we have discussed with the people down there now, it could go up to about 120 people, permanent.

Q Mr. Williams, what are your ratios of employment to unemployment, of IBEW members for the last five years?

A What are the ratios?

Q Yes.

A For the employment versus the unemployment?

Q Yes, sir.

A Well, I don't have the exact figures over a 5-year period, but the unemployment in the last six months has been greater than it has been in any other 5-year period.

Q Do you have any ratios at all?

A We don't try to keep a ratio as such. We base it on the number of people that are on the out of work lists and the various locals throughout the state.

Q In your Interrogatory No. 17, you told us that you had no accurate figures on employment-unemployment ratios for the past five years?

A That's correct, no accurate figures. That's what I said.

Q You haven't tried to get any in advance of your testimony here?

A The ones that we have are the unemployment that we had up until the date when we were required to submit the submission as to the latest ones that we had. There are some since then, and the unemployment keeps increasing.

Q How many of the folks who are IBEW members are at work on the Colstrip 1 and 2 project?

A Now?

Q Yes.

A I believe there are a little over a hundred.

Q Of those one hundred folks, how many of them have been residents of the state of Montana for five years or more?

A I have no idea.

Q Can you tell me, Mr. Williams, what you were not able to tell me in the answers to interrogatories, how many people who are employable in Rosebud County, have been consulted by the IBEW prior to your coming here today to testify?

A How many people in Rosebud County did we consult?

Q Yes, sir.

A I don't believe we consulted anybody outside of the scope of the IBEW members.

Q How many IBEW members in Rosebud County have you consulted?

A Consulted about what?

Q About anything in relation to the testimony that you're giving in this proceeding?

A We probably asked them when they applied to sign the book, whether they wanted to go to work, if we had work available.

Q Anything other than that?

A I don't know what else we'd ask them. They were the ones that mostly asked the questions. We're supposed to provide the answers.

Q And one of your answers was not to inquire as to what their wishes were on the testimony that you're offering here?

A Well, I would assume that when they come in to sign the out of work list, they communicated a desire to go to work, be it at Colstrip, be it in Billings, or wherever we had jobs available, and we ask them, if we have more than one job, where they would like to work. Unfortunately, we haven't had that position to be able to offer them alternatives.

Q But you do ask them as to preferences?

A Sometimes, if we can.

Q Good. What have they said?

A They ask us where the jobs are at, how much pay per hour and if there's any subsistence.

Q And after you give them the answers to those questions, what do they say as to their preferences?

A Well, it all depends upon what their preference may be. Some may want to go to the highest paying job, and some may want to go where there's subsistence.

Q One of the folks who participated in the answers to the interrogatories that have been served upon you, Mr. Williams, was Robert Labrie, of the Montana Power Company?

A Yes.

Q What was the manner in which he participated in the answers to those questions?

A Some of the questions that you asked of me on interrogatories we didn't have any way of finding out unless we contacted somebody from the power company. When we contacted the power company, we were referred to Mr. Labrie.

Q And he gave you the answers, and you put them in?

A The ones that we asked him, yes.

Q I'm not sure we have it on the record, Mr. Williams, but the IBEW has withdrawn from the AFL-CIO, has it not?

A No, it hasn't.

Q Are you fully a member of the State AFL-CIO?

A Some of our local unions are, yes.

Q What about the overall IBEW?

A Some don't, some do.

Q You're not here testifying on behalf of the AFL-CIO, are you, sir?

A No.

MR. SHENKER: Nothing further, thank you.

HEARINGS EXAMINER: Mr. Meloy.

MR. MELOY: No questions, Mr. Davis.

HEARINGS EXAMINER: Mr. Graybill.

MR. GRAYBILL: No questions.

HEARINGS EXAMINER: Mr. Hilley, any redirect?

Redirect, by International Brotherhood of Electrical Workers

By Mr. Hilley:

Q Do you know who made the decision to support the power companies' application for the construction of Colstrip 3 and 4?

A Well, because of the knowledge that we have been able to obtain in the IBEW, being so close to the needs of the electrical industry, we in the IBEW felt that there was going to be a need to build powerhouses, nuclear, fossil, any type of generating plant, in order to fit the needs of a growing community in the United States; therefore, by actions at the various meetings, and because of the problems that we were facing, the International President, along with the International Vice-Presidents, have adopted a policy to follow, that we are in favor of the building of generating plants.

A All right, now, the IBEW intervened in these proceedings last spring, isn't this correct?

A Yes.

Q Since your intervention and the subsequent publicity, have you had any objections from your members for intervening?

A None.

Q If you know, could you give us what the position -- let's say, official position -- would be of the railway unions?

A It was my understanding through the discussions that I've had with the Montana AFL-CIO that the AFL-CIO and the railroad unions would take a position of not entering in or involving themselves in the discussions concerning the building of Colstrip 3 and 4.

Q Would the Hearings Officer take administrative notice of the fact that the railway unions have not intervened in these proceedings either way?

HEARING EXAMINER: Yes.

Q Now, Mr. Williams, there have been some questions regarding your polling of the people in Rosebud County and so forth, and apparently an implication of a lack of your duty to take these polls and make alternatives to 3 and 4, et cetera. Hasn't the IBEW, in fact, retained an economist to help search for the conditions of the state and some of these alternatives?

A Yes, we have.

Q Does the IBEW, through its attorneys and economists and so forth and so on, have any alternatives come up for the answer to get rid of 3 and 4?

A No.

Q Now, you know what NECA means, don't you?

A Yes. It stands for the National Electric Contractors Association.

Q Does this organization represent the majority of the contractors, if you know, in the state?

A It currently does, yes.

Q And this is a national organization?

A Yes.

Q When future major projects are being planned in the state of Montana, does this organization generally know in advance?

A On some occasions they do, and on some occasions they don't. It depends on the size of the project, if it's a government project, such as Libby Dam. A general contractor, or a conglomerate of contractors, will call for a -- go to the federal government and make a bid. In most cases, the DMCA would not be involved at that time. It could be if there was a small job in the area, that a contractor coming in from outside of the state would like to sit down and discuss the job prior to the starting and then the local DMCA chapter would be notified.

Q But when they do come in from out of state, when they get here, as a general rule, they do contact NECA?

A In most cases they do, yes, or in some cases, if they didn't, they would contact the local union directly.

Q When you say contact the local union, as a matter of fact, they're obligated to contact the local union if they have a contract, isn't this true?

A Yes.

Q And how does this come about? Can you explain this process?

A Well, if the contractor is successful in bidding a job, he sets a time that the job will start and he will come in prior to the starting of the job, sit down with the local union business agent, discuss the manpower requirements, question any portions of the agreement that he may not understand, fill out the necessary forms for Health and Welfare, the 1%, or whatever, pension plan that may be available in the area and then sign a letter of assent, either (a) or (b), to the current working agreement.

Q Then, before these projects start, it's a general rule that even the unions know in advance?

A Yes.

Q Now, your job is International Representative. Do you cover the state of Montana?

A Yes.

Q And are you in constant, or let's say, relatively constant, communication with these local unions?

A Yes.

Q Are you familiar with any major projects that you've been notified of?

A The only one that I know that we've got anything scheduled, of any size of all, we've got a pre-job conference set up for the 18th of this month for the gasification plant at ASARCO in East Helena.

Q And this is the only major project you've been contacted on?

A Right.

Q What other major projects are just going on right now in the state?

A Well, outside of Colstrip 1 and 2, we've got some residential wiring going on. We have some small work going on at the University in Bozeman. We have the concluding few weeks at the powerhouse in Libby Dam, and we have little or no line of construction work that is not associated with the power line coming from Colstrip.

Q Would you say, based upon your experience in the past five years, whether major construction projects today are up or down?

A They're down.

Q What about layoffs going on in the state?

A They're drastic. In our Anaconda operations, where we represent the electricians, we have, through layoffs, lost half of the people in Great Falls. We are currently almost 50% layoff in the Butte operations, and we are down in Anaconda to about one-third of the work force laid off. We have lost some people at the Anaconda Aluminum Plant through reductions. Our position in construction, both inside and out, is increasing in unemployment, rather than decreasing. The cable television industry -- about the only one that has done any hiring, as far as we're concerned, for permanent employees, in the last three or four months, has been Mountain Bell, and they've hired some operators and some clerical people.

Q Do you think that this bears some sort of a direct relationship with why so many people are waiting to get jobs in your hiring halls?

A Well, we certainly do. One of the positions that we've always maintained is that we feel very strongly, as we have indicated in testimony quite frequently -- we feel this is one of the areas where we don't want to go through another situation like we did in Anaconda. We're taking the natural resources out of the state. We feel this is a place where we can dig it, we can generate it into power, and we'd rather transport the power outside of the state of Montana than our children, and our people that we have on the unemployment.

Q What percent, in your estimation, of electrical contractors in the state, do you have contracts with?

A We have about 90%.

Q Now, you've heard the question by Mr. Shenker, how many employees come in and go out of the state on various projects in the past five years. I won't limit this to the 5-year period. My question is primarily this: Is there preferential hiring for Montanans under your hiring hall procedure?

A Yes, in our construction agreements.

Q Is this a matter of contract?

A Yes.

Q Can you explain this preferential hiring for Montanans?

A Well, we have what we call a referral procedure in the agreement, and within that referral procedure, there are four groups. Group 1 designates that he must be a journeyman, and whatever classification he might be, lineman or wireman, passed a qualifying test, has worked under the existing contract between the parties for at least one year, and in some cases, two years, and has maintained a residence in the area. Group 2 would be anyone who has passed the qualified test. He would not necessarily have to be a resident of the area, but he would have to be a journeyman, and Group 3 would be that he has had some experience in the trade, has not passed a qualifying test, and Group 4 is for anyone who wishes to come down and sign the book and they have no requirements whatsoever, and the way that they're referred out, they're referred out until 1 is exhausted, then out of Book 2, Book 3, and then to Book 4.

Q Your cross-examination was primarily electricians and electrical work with some interjections about the AFL-CIO, particularly the state. My question is this --

MR. SHENKER: I'd like to have the question without the preludes, Mr. Hearing Examiner. I'll move to strike the preludes, which mischaracterize the cross-examination and are inappropriate, in any event.

HEARING EXAMINER: It will be stricken. You can just ask the question.

Q My question is this: How many other labor organizations have gone on record in support of Colstrip 3 and 4?

A I have attended meetings of the Montana State Building Trades and they've gone on record in support of the building of Colstrip 3 and 4, and I know that the Operating Engineers' local unions have gone in support of the building of Colstrip 3 and 4. There are others, of course, but they're the -- except that I want to -- through this statement that is in here, Peter Lombardozzi, the business agent of Local Union 552, contacted all of the local unions in the construction industry in the Billings area and they, too, indicated to him their concern and their support in the building of Colstrip 3 and 4. There were other local unions that have attended the meetings throughout the state, individual local unions, but I couldn't recall what their numbers were or what their affiliation was.

Q Can you tell us how many unions belong to the state building trades?

A To my knowledge, there are at least eleven. There could be upwards of seventeen. That is affiliated. That is not the number of local unions. That's the international unions. The local union numbers, I'd have no way of knowing.

Q Could you give us a test of your memory as far as who are members?

A Well, there's the IBW, the ironworkers, the carpenters, the bricklayers, the operating engineers, the laborers, the plumbers and fitters, the roofers, the asbestos workers.

Q And so forth, right?

A Right.

Q To your knowledge, is there an official policy regarding the construction of Colstrip 3 and 4 from the Montana State AFL-CIO?

A No.

MR. HILLEY: No further questions.

Re-cross by Department of Natural Resources and Conservation

By Mr. Shenker:

Q How many labor unions are there in Montana, Mr. Williams?

A Local unions?

Q Well, give them to me any way you can.

A I wouldn't have any idea of how many locals there are.

Q How many internationals are there?

A Between eleven and seventeen. Some of the international unions come in the state on certain jobs and then go back out, but locals unions right in the state, it varies on different occasions.

Q What's a ballpark estimate on the number of local unions there are in the state?

A I'd say between 250 and 300.

Q You told Mr. Hilley in your redirect examination of the general policy of the IBEW and that there's a need for power, and therefore you're in favor of generating plants?

A Yes.

Q I take it that policy doesn't tell us where the generating plants should be, would that be correct?

A No, it does not.

Q It doesn't tell us about the relative advantages of being near a load center or not near a load center?

A No.

Q What if I asked you to assume, Mr. Williams, that between now and 1990, there is adequate peak power available for the entire Pacific Northwest, and between now and 1985, there is adequate energy for all five of the applicants, with the exception of one year, 1981, when 125 megawatts of energy might be necessary? How would that affect your judgment as to the need for power plants?

A Would you repeat the question?

Q I'll ask you to assume that between now and 1990, there is adequate peak power available for the entire Pacific Northwest, including Montana, and that between now and 1985, there is adequate energy available for all five of the applicants in this proceeding, with the exception of one year, 1981-1982, in which there may be a need for 125 megawatts of energy. How would that affect your judgment on the need for power plants?

A I believe that Colstrip 3 and 4 should be built.

Q Whether you need it or not?

A I believe there's a need. You asked me to assume, and I'm assuming there's going to be a need from the knowledge I've gained and the experience I've had with the IBEW.

Q You see, Mr. Williams, we have some rules in this proceeding. I've just asked you what's called a hypothetical question, in which you assume some things because I ask you to assume those things; whether you accept them or not, you have to assume them. Having assumed those two little pieces of information that I gave you about peak power and energy, how does that affect your judgment on the need for building power plants?

A Well, I can't assume it.

Q You have to assume it, sir.

A I do?

Q Yes.

A My answer is still the same, then.

Q Okay, whether you need it or not.

A I didn't say they need it or not. I'm saying that 3 and 4 should be built. You're doing the assuming, I'm only answering.

Q I'm trying to get you to answer, Mr. Williams.

A I'm trying my best to answer, too.

Q Mr. Davis, maybe I may need some help on the hypothetical question. I'm asking you to make two assumptions, and the record will determine whether the assumptions are correct. It is not for you to determine whether the assumptions are correct. Now, making those assumptions, won't you concede for the record, Mr. Williams, that the Colstrip units 3 and 4 aren't needed?

A No, I can't, because of all the things that I've read and all of the meetings I have attended and all of the forecasts that have been made available to me, I can't assume that there will not be a need for electricity in 1980 or '81 or '82 or '83 or '84 or '85, and I can't assume something that I can't believe in.

Q Ah, alas! Well, let me break it down. Are you willing to assume that there is no need for peak capacity, peak power -- you know the difference between peak and energy, don't you, sir?

A I believe I do.

Q Are you willing to assume that there is no need for peak capacity in the Pacific Northwest between now and 1990?

A Am I willing to assume that?

Q Yes, sir.

A No.

Q Okay. That's one in which we have a little problem, then, because we have some uncontraverted evidence on that, Mr. Williams. Let me try it on you this way -- if you were to assume those two things that I asked you to assume, wouldn't that tell you that there was no need for the Colstrip units?

A Who would be telling me this?

Q The facts, if you assumed them, sir --

A I just don't feel -- all of the facts that have been presented to me indicate that there is a need for Colstrip 3 and 4.

Q And you're going to adhere to that view, notwithstanding whatever facts are contrary with your position, right?

A I can't answer it any way other than I have.

Q We'll let it go. Mr. Hilley was asking you about a polling process in Rosebud County. You got into this interesting discussion about how you had hired this economist and attorneys in order to search out some of the alternatives. Did you direct your attorneys or economist to determine the alternatives to Colstrip 3 and 4?

A I did not.

Q Further on the polling process, Mr. Williams, at any time since the IBEW has entered these proceedings as an intervener, has it circulated a poll within the membership of the IBEW to see what its views are on the subject of Colstrip 3 and 4?

A We have not circulated a poll. It's been discussed at practically every one of the regional meetings we have had and at almost every one of the local union meetings that we have had.

Q How is it discussed? Does the President tell the Vice-President and the Vice-President tells somebody else, and someone else tells the group?

A No. It's been brought up. There have been various questions, like people are wondering why all the delay. A lot of the people are wondering how come their tax-paying money is going out of the state when they're unemployed. They keep raising the question as to why the same things are gone over and over and over again, why the delay in the hearings, et cetera. They want to know when they can go to work; they want to know what Colstrip what will mean to them when they're coming out of college. Are there going to be jobs available during the building of it?

Q What did you tell them about why the delays?

A Well, we haven't been able to give them a very good answer.

Q This is your first day at the hearings, isn't it, Mr. Williams?

A No, it isn't. I sat there and watched you on several occasions.

Q When was that, sir?

A Oh, in August, June.

Q In the Board of Health proceeding?

A No, during these here. My answer has been, because of attorneys.

Q Not because of IBEW attorneys?

A No, we haven't been here.

Q Now, this proceeding began on the 19th of May, 1975, and concluded on the 5th of June, 1975, and then we went to a hearing before the Board of Health and Environmental Science. The IBEW determined not to participate in that proceeding because they had no expertise, is that correct?

A That's right.

Q So after the three weeks last spring, this proceeding recommenced on the 19th of January, and today is the 10th of February. Is this the first time you've been here since the 19th of January?

A No.

Q When were you here before?

A One day last week.

Q How long were you here?

A About 15 or 20 minutes.

Q Based upon that 15 or 20 minutes, did you then have some new information to convey to your members as to why the attorneys were protracting the proceedings for three weeks?

A Absolutely not.

Q Now, you discussed with Mr. Hilley your preference policy for

Montanans. As I understood your prescription to Mr. Hilley, if someone has lived in Montana for a year or possibly two years, in some cases, they're Montanans, right?

A No, I said that the procedure set forth in the agreement provides a grouping. In Group 1 --

Q I've heard all of that, Mr. Williams. You don't have to go into that all over again, but part of it was Montanans. Now, just tell me about that part. Are you a Montanan if you have lived here for a year?

A I don't know what significance a year is. If a person is living here in Montana, I consider him a Montanan.

Q Well, under your agreement, Mr. Williams, doesn't someone have to reside in Montana for a year to be in the preference group 1?

A He has to work within the agreement for one year.

Q Wasn't there a residence requirement, too?

A Yes, and that was in Group 1. He has to maintain a residence within the geographical area of the agreement.

Q For one year?

A Yes.

Q That's the only residence requirement that you have for a Montanan in Group 1?

A Yes.

Q In a way of speaking, that's the toughest residence requirement that you have in Group 1?

A It's the only one.

Q Then, your preference for Montanans in hiring practices is a preference for people who have lived in this state for one year and complied with your other requirements?

A In addition to the agreement, it is my belief that it should be in all cases.

MR. SHENKER: I have nothing further. Thank you.

HEARINGS EXAMINER: Mr. Meloy?

MR. MELOY: No questions.

HEARINGS EXAMINER: Mr. Graybill?

Re-cross by Northern Plains Resource Council

By Mr. Graybill:

Q Mr. Williams, I'm an attorney, and I'm bothered with your bland statement that the length, I think it is, of these hearings, is caused by attorneys. Someone told you that, or do you have some knowledge of why that is?

A No, as I said, the few times that I've attended the hearings, it seems to me that some of the questions have been asked by attorneys, and if I were to indicate, which I did, who is delaying -- why the delay, I indicated it's because of attorneys.

Q Have you got a law degree?

A No, I haven't.

Q So you're in somewhat the same position I would be, standing under a 500 kv line, suggesting why they didn't fix the line faster, and I'd say, it's because of the linemen?

A That's one of the reasons when they asked why the delays, I indicated I believed it was because of the attorneys, and you're right, I have no idea of the law.

Q Surely, if there was a line out and it hadn't been put back in service, and men were working on it, I could say it was because of the linemen, couldn't I, in the same manner?

A You often do. We get blamed.

Q Do you have me in mind as one of the attorneys who caused delay in this hearing?

A I would group them all into one.

Q Pardon?

A I said I group attorneys all into one. When I mentioned it, I didn't say one, specifically, I just said attorneys.

Q Now, be careful what you just said, because Mr. Hilley, your counsel, just fell in that group.

A I'm putting him in the group, also -- like I said, I'm not distinguishing one against the other.

Q But surely, you aren't saying it's partly Ben's fault that the hearing has taken so long, are you?

A I've already made my statement.

Q Is that question too tough for you, Mr. Williams?

A No, it isn't.

Q Well, then, answer it.

A What was the question?

Q The question was, surely you don't believe Mr. Hilley is responsible for dragging out the hearings, do you?

A Maybe not so much the hearings, but there have been occasions when I have wished he'd rushed through some of the stuff we've been after.

Q Well, at the risk of losing a colleague's practice for him, I'm going to stop this line of questioning.

HEARINGS EXAMINER: Do you have anything in defense of yourself, Mr. Hilley, or shall we let Mr. Williams go?

MR. HILLEY: No, sir, Your Honor.

HEARINGS EXAMINER: All right, sir, you're excused. Thank you for your attendance.

(WITNESS EXCUSED.)

HEARINGS EXAMINER: The next witness.

EUGENE S. ZOBEL, called as a witness by the Applicants, having been first duly sworn upon his oath, was examined and testified as follows:

MR. PETERSON: The applicants move into evidence Exhibits 70, 71, 72, 79-A, 79-B, 79-C, 80, 81, 87, 95-A, 95-B, 95-C, 95-D, 95-E, 95-F, 95-H, 95-I, 98 and 99.

(THE WRITTEN DIRECT TESTIMONY OF MR. EUGENE S. ZOBEL WAS DIRECTED TO BE INSERTED AT THIS POINT.)

TESTIMONY OF EUGENE S. ZOBEL

My name is Eugene S. Zobel and I graduated from the Citadel, Charleston, South Carolina, with a Bachelor of Science Degree in Civil Engineering. I completed a course in "Analysis of Continuous Frames" at Carnegie Institute of Technology and am a Registered Professional Engineer in Pennsylvania, North Carolina, Florida, South Carolina, Montana and Maryland.

Since joining Chas. T. Main, Inc. in 1969, I have been used as a consultant on a number of 230 kV and 345 kV transmission line projects. In addition, I have been the Project Manager on the following projects: Design and detailing of transmission tower extensions; Feasibility study on use of old 66 kV right-of-way for new 230 kV circuits and suggestions for aesthetic structures; Evaluation of aesthetics, reliability and cost of several wood structures for 115 kV lines in an urban area; Investigation of existing 115 kV double circuit steel structures for upgrading to 230 kV and installing larger conductors; Environmental report on the location and aesthetics of a 95-mile 230 kV line; Environmental review of location and aesthetics of supporting structures for seven 230 kV circuits emanating from a nuclear plant; Environmental review of location, aesthetics and overall impact of a proposed 765 kV line.

I have had over thirty years of experience on transmission line work and have been responsible for about eleven thousand miles of transmission line engineering, maintenance and construction for the American Electric Power System for about thirteen years. This work included design of 345 kV, 500 kV and development of 765 kV towers, use of new guyed aluminum structures, construction with the use of helicopters, design and testing of structures and anchors, and the technical and bid specifications for transmission line materials and construction. Prior to that I worked with the American Bridge Company for a period of thirteen years on detailing and design of transmission line towers and structures and transmission substation structures.

For four years I worked as a self-employed Transmission Line Consultant, and the following are some of the jobs on which I have worked: Redesign of existing towers for upgrading and installation of insulated crossarms and larger conductors; aesthetics for 230 kV and 345 Kv designs in urban areas; evaluation of cracked steel bases and recommendations for corrective measures; evaluation of popped strands on large conductor, which occurred during stringing, to determine the cause; design of special double circuit tower with foundations for 110 degree line angle; use of strut insulators for economical design; selection of economical guyed tower foundations; evaluation of strength and economics of available tower anchors as well as new anchor designs; advice on writing aluminum tower specifications; recommendations on guy anchors, test program, witnessing installation and testing, and preparation of anchor test evaluation report; economical and feasibility study for 230 kV line using wood, steel, or aluminum structures on the coast of Peru; economic study of aluminum versus steel construction and also the effect of helicopter construction on costs; material and labor costs for a 345 kV aluminum structure line; line design for 138 kV wood pole line on old 69 kV line right-of-way; advice on line costs for two different parties contesting utility EHV line locations; testimony before the Public Utilities Commission of New Jersey; recommendations on ground clearances for high conductor temperature during emergencies; review of material bid specifications for 345 kV transmission line project.

On a two-year contract on special assignment in Iran, I served as an advisor to the Ministry of Water and Power on all transmission line matters. This included the following: Advised on the training of engineers in all phases of transmission line design engineering; designed wood structures and advised on construction during two emergencies where 132 kV steel tower failures and how to strengthen towers to prevent repeat of trouble; supervised complete set of technical and bid specifications and drawings for 460 miles of 132 kV lines; advised on complete line location and line design or spotting of structures; prepared or supervised complete set of technical and bid specifications and drawings for 220 miles of 230 kV lines; advised on complete line location and line design and spotting or structures for the above project.

I am a Senior Member of the Institute of Electrical and Electronics Engineers, a member of the Transmission and Distribution Committee, a member of Towers, Poles and Conductors subcommittee of the transmission and distribution Committee, and Chairman of the Task Force on Line Loadings and Strengths of Transmission Line Structures. I was formerly a member of the Transmission and Distribution Committee of the Edison Electric

Institute and Chairman of the Task Force on Galloping Conductors. I am a permanent Member of the International Organization for High Voltage Transmission System (CIGRE). I am also a member of the Technical Exchange on Transmission of Electric Power Committee (Ultra High Voltage) between United States of America and the Soviet Union.

The following is a list of technical articles of which I was either author or co-author: "Lightning and Corona Performance of 330 kV Lines on the AG&E and OVEC Systems", AIEE Transactions, Part III, Power Apparatus & Systems, Vol. 75, August 1956; "Development of Structure and Anchor Designs for Guyed 'V'-Type Towers," IEEE Transactions Paper No. 64-62; "Potential of Helicopter Use for Transmission Line Construction," ASCE Transportation Conference Paper; "Field Testing of Tower for Broken Conductor Impact Load," AIEE Conference Paper No. 61-1189; "Comparison of Results of Various Anchor Tests by AEP," IEEE Conference Paper No. 31 CP 65-749; "Insulators Lose Strength with Age, Tests Show," September 24, 1962, ELECTRICAL WORLD; "Wind and Ice Design Loads for Transmission Lines of AEP," Conference Paper No. CP 61-233; "Ice Buildup on Conductors," Power Apparatus and Systems Transactions Paper 59-1122; "Helicopter Reduces Transmission Construction Time 50%," ELECTRICAL WORLD, May 1, 1961; "Aeolian Vibration Tests on the 345 kV Muskingum-Tidd Line," Transactions Paper 59-208; "Insulating Crossarms for Uprating Steel Lines," IEEE Conference Paper No. 70 CP 627 PWR; "Evaluation of Conductor to Ground Clearances for Normal and Emergency Operations at Elevated Temperatures," IEE Conference Paper No. 71 CP 169 PWR.

My association with Colstrip Units 3 and 4 began in December, 1972, and I began actual involvement on the Transmission Line in February, 1973. The Transmission Line proposed for Units 3 and 4 will use 8 different tower structures, which are almost identical to those shown in Applicants' Ex. 70, 71 and 72.

Applicants' Ex. 70 is what is known as a guyed "Y" type tower with Delta phase configuration and is in suspension, which means the wires pass through the tower without a direct in line connection. There are 3 types of this structure, namely: "SYH" (heavy);"SYM" (medium); and "SYL" (light).

This structure will be used on the line where property owners do not insist on self-supporting structures and where the change in line direction does not change the angle sharply.

Applicants' Ex. 71 is a self supported Delta configuration with the same suspension characteristics as Ex. 70. It is used as a replacement for the guyed "Y" structure (Ex. 70) when requested by landowners in agricultural lands or extreme side hill situations where guyed structures are not suitable.

Applicants' Ex. 72 is also self supported Delta phase configuration, strain type tower. This means the conductor comes directly into the structure. Even though it is insulated, the conductor does not pass through the structure in suspension. It is essentially "dead ended" but insulated. This tower is used at angles where line directions change at over 12 degrees and also serves as the terminal structure at the substations or end of the line.

Each structure is galvanized steel and all insulation is glass. The structures are set in concrete as are the guy anchors which were used.

The construction will be long span construction which envisions approximately 4 structures per mile and thus the visual exposure is minimized. Further, we will construct so as to avoid, as much as possible, population centers or residences. They are "see through" structures where the members are relatively small and thus does not present a massive silhouette against the landscape. The galvanized structure against the sky line at a reasonable distance thus dissipates so that the appearance of the structure is definitely minimized.

Alternatives to these structures which were considered and rejected were: (1) aluminum; (2) wood; and (3) welded steel pole. Aluminum is more expensive, about 20%-25% higher on material, while appearance is similar and some reduction in construction cost can be achieved. Laminated wood or wood poles create higher maintenance problem, but most important, the wood poles would require two more structures every mile, and thus raise aesthetic objections. Wood crossarms and poles often catch fire and can start forest fires, as well as be consumed by forest fires started from other causes. Hot line maintenance is difficult and special techniques are needed to ground climbing linemen. Experience with wood structures at 500 kV is extremely limited and not yet thoroughly tested to warrant their use on this type of project.

The welded steel pole structures are more massive than those now proposed for the Colstrip line. These poles would be thick welded steel about 5 to 6 feet in diameter (minimum) and would cost at least 30 per cent more. Both with wood and welded steel the environmental considerations are negative because they have to be hauled to the site in one piece or several very long pieces, whereas the structures now proposed are assembled at the site. Thus access for construction is minimal compared to wood and welded steel. In high terrain over switch-back forest roads, access to the site by hauling such massive poles at least fifty feet in length present unnecessary problems to roads and terrain which can be easily avoided with the use of the structures proposed for the Colstrip line.

Engineering considerations for the proposed structures (Ex. 70, 71, 72) are many. Wind and ice loads in Montana are significant. To evaluate this problem, Chas. T. Main, Inc. engaged the services of Meteorology Research, Inc., of Altadena, California. They presented a preliminary report to Chas. T. Main, Inc. followed by a final report, under date of May 31, 1974, which is Applicants' Ex. 87. This study was based on 6 mobile testing sites on the preferred location of the proposed line to gather weather data over a 7 month period (October, 1973 to April, 1974) and a study of existing weather data.

Based upon this data we concluded that the line will have to be designed and constructed to withstand 2 inches of radial ice with no wind or a 120 mile per hour wind on bare wire, which are the most extremes anticipated. We also design for unbalanced ice load, that is, a condition where ice drops off the wire which can twist the structures. We know of a situation in Wisconsin, for example, where 2 utilities lost about 70 miles of 345 kV line because of failure to design for an unbalanced load condition.

I conclude that it is reasonable to use the 2 inch radial ice unbalance condition and 120 mile per hour wind or bare wire as proper design criteria for safety and reliability.

In addition, the proposed line is designed with 2 shield wires (7 Stand No. 5) located so that the phase wires would be protected from direct lighting strike, thus minimizing line trip-outs. The shield wire is insulated from the structures in about 7 mile sections to reduce line losses, minimize underground corrosion from underground current between structures, and improve ground relaying.

As an engineering consideration, tower grounding is necessary to minimize line trip-outs from back flash of insulators. This is primarily a safety precaution because it reduces tower top potential which will be explained by Robert Ender.

Soil samples will be taken about every 2 miles (in some cases closer, when needed) to provide data for proper foundation and anchor design. This practice is presently done in the construction of the Colstrip to Broadview line now under construction by The Montana Power Company.

A full scale anchor test program was conducted by Chas. T. Main, Inc. under my direction and completed June 19, 1974. The results of this study, together with the data collected are contained in Applicants' Ex. 80. This study permitted adequate and economical anchor and foundation design which is now being implemented in the Colstrip to Broadview line. We concluded from the study that 2 to 3 types of guy anchors which are shown in Exhibit 80 as Type B (Explosive Anchor - Drawing No. SK-A503-2323-40), Type C (Augered Bell - Drawing No. SK-A503-2323-42) and Type L (Reinforced Log - Drawing No. SK-A503-2323-

46) are adequate for their purpose.

Foundation anchor selected is shown in Exhibit 80, as Augured Foundation Type A (Drawing No. SK-A503-2323-53). Each was selected on performance and economics. We used a test rig of 120,000 pound uplift capacity, which essentially attempts to pull the anchor out of the ground. This capacity exceeded the worst guy load by approximately 20% and from the results we selected the guy anchors and foundations which I just described. It is anticipated that this study is applicable to the line west of Broadview, but in the event that geological data is vitally different west of Broadview to Hot Springs, additional testing will be done to substantiate the selection of the proper anchors and foundations.

Tower testing for engineering design and detailing strength of structures was conducted by American Bridge Division of United States Steel, which is the supplier of the structures from Colstrip to Broadview line. While the proposed suppliers for the line west of Broadview and the parallel 500 kV from Colstrip to Broadview has not been selected and may be a different supplier, the data gathered from the tower testing is essentially the same needed for the structures for Colstrip 3 and 4. On large projects such as the proposed transmission line in this case, it is common practice to perform full scale tests for selected types of structures to be used on the project. The tower concepts and loads for this project are sufficiently different from other projects to warrant these tests. The prime reason for tower testing is to evaluate the effect of design of the critical joints in the structure. Both computer and stress diagram design assume pin connections without joint eccentricities. Tower testing is nothing more than checking actual design and shop detailing as compared with the theory or design assumptions. In actual preparation of shop details it is impossible to eliminate all eccentricities and use of gusset plates is usually necessary. The tower testing evaluates the performance of the structure as forces in members are changed due to these eccentricities and joint rigidity resulting from multiple bolt connections as compared with a single pin.

The results of this tower testing are included in Applicants' Exhibits 79A, 79B and 79C. Exhibit 79A tested the "SYL" tower structure (Applicants' Ex. 70), Exhibit 79B tested the "T 30" structure (Applicants' Ex. 72) and Exhibit 79C tested the "SH" structure (Applicants' Ex. 71). Each test substantiated that the structures as designed and modified during testing were suitable for installation in the Colstrip project.

The line components which consist of conductors, shield wires, insulators, hardware and accessories were slected with sufficient strength to be compatible with the strength of the tower itself.

A consideration relevant to construction of transmission lines is the effect of the structures on agricultural land. Examples of such structures which have been constructed in other areas and which illustrate the effects of the structures on agricultural land shown in a series of photographs of Applicants' Exhibits 95.

Applicants' Ex. 95A, 95B and 95C are examples of structures represented by Ex. 70, which are guyed towers. All of these photographs were taken under my direction and control in Southern Indiana of a 765 kV line constructed through farm land. Photos A, B and C show tower and guy wire construction and how farming operations can work around the structures and guys.

Applicants' Ex. 95D, 95E and 95F show free standing structures as illustrated on Applicants' Ex. 71. Exhibits 95D and 95F are 345 kV lines and 95E is a 765 kV line. Exhibit 95E demonstrates how the farming operator worked beneath the structure. The size of equipment and base legs of the structure of course will dictate the feasibility of such operation. Applicants' Ex. 95H is another 765 kV line structure located at the edge of the farmed area. Applicants' Ex. 95I is also a 765 kV line, free standing, similar to those proposed for Colstrip. The 765 kV tower structure is similar in size to the proposed 500 kV structure to be installed for Colstrip 3 and 4.

In order to determine the amount of land needed for the structure, I had Applicants' Ex. 99 prepared to demonstrate to scale the loss of land for each type of structure. The guyed tower structure with supporting guys will utilize approximately 600 square feet of land and the free standing structure about 1100 square feet. Each estimate applies to farm land. Further, I have calculated the amount of land to be withdrawn from use for agricultural purposes for the entire 500 kV Colstrip line. An examination of the proposed corridor shows that 98.4 circuit miles of farmland will be crossed. This was done by examining aerial photographs of the proposed corridor. Since free standing towers will be constructed at a space of about 4.2 towers per mile, it can be readily seen that only 10.43 total acres will be taken from production for the entire project. If only guy towers are used rather than free standing, and since farming can be conducted within the guys and towers as clearly shown on Applicants' Ex. 95A, 95B and 95C, then the total acreage removed from production will be 5.69 acres. The Westinghouse Environmental Impact Report showed 289.55 acres will be lost to production, but this assumed mostly all guy towers and little farming within the confines of the guys and tower. Estimates of farm areas were taken from agriculture maps rather than aerial photos.

Construction of the two 500 kV lines will require observance of good construction practice which considers the landowner, the environmental impacts, economics and engineering considerations. The ultimate goal will require that guidelines for construction will become part of the contract with the successful bidder. These will include such matters as (1) construction camps or facilities; (2) public safety and protection or property; (3) access roads and vehicle movement; (4) clearing and grading; (5) stream beds; (6) fences and cattle guards; (7) erosion; (8) archaeology; (9) control of fires; (10) waste disposal; (11) herbicides; (12) post construction and clean up and road closure.

Specifically, the contractor will be responsible to follow these guidelines:

1.0 CONSTRUCTION FACILITIES

1.1 The preservation of the landscape shall be an imperative consideration in the location of construction camps, storage areas, and buildings required temporarily in the performance of the work. Contractors' plans showing campsites, storage and housing facilities shall be submitted for approval of the owner.

1.2 Such sites shall be kept as small as possible and will be located in available areas of minimum vegetation and slope. Full restoration and reshaping of these areas shall be made upon completion of their use.

1.3 Borrow material area and batch sites will be authorized only by special permit. Full restoration and reshaping of these areas will be necessary.

1.4 All portions of the work areas shall be maintained in a neat, clean and sanitary condition at all times.

2.0 PUBLIC SAFETY AND PROTECTION OF PROPERTY

2.1 Operations shall be conducted so as not to close or obstruct any portion of any railroad, road, or other property until permits have been obtained from the governmental or other authorities having jurisdiction.

2.2 All cultivated and planted areas and vegetation such as trees, plants, shrubs and grass on or adjacent to the premises which do not reasonably interfere with the performance of work shall be preserved.

2.3 Reasonable precautions shall be taken to protect, inplace, all public land survey monuments and private property corners. If any such land markers or monuments are inadvertently destroyed, they shall be re-established referenced in accordance with the procedures outlined in the "Manual of Instructions for the Survey of the Public Land of the United States" or the specifications of the county engineer in the case or private property.

2.4 Firearms are not permitted to be carried by any construction worker involved in this project while he is on or in the vicinity of the project. Violators of any State, Federal, or International law protecting wildlife will be referred to the proper authorities.

3.0 ACCESS ROADS AND VEHICLE MOVEMENT

3.1 System roads and other existing roads will be marked for use as access roads wherever feasible. It is the intent of the owner to hold construction of new roads to the absolute minimum.

3.2 New roads shall follow Engineer approved routes and shall be constructed with the minimum possible clearing and soil disturbance.

3.3 The road width shall be determined by need, such as equipment size, and shall be no wider than necessary.

3.4 During construction, unauthorized cross-country travel and creation of roads beyond those approved will be strictly prohibited.

3.5 The limits of where construction equipment and vehicles can and cannot go shall be clearly marked at each new site before equipment is brought in. Construction foremen and personnel shall be well versed in recognizing these markers and shall understand the restriction on equipment movement that is involved.

4.0 CLEARING AND GRADING

4.1 Clearing for roads and right-of-way in shrub areas shall be limited to crushing rather than uprooting brush. Plants may be clipped off at ground level, leaving roots undisturbed so that they may resprout.

4.2 Where centerline clearing is allowed, it shall be limited to the cutting of trees which will interfere with operation of the line. In valleys where the wires would touch the tree tops during stringing, clearing shall be for a width of 10 feet on each side of the outer phase conductor positions if the trees create difficulty during tension stringing operations.

4.3 Scalping of the earth or any unnecessary disturbance will not be allowed on any clearing, except in rocky areas, or on slopes where cuts and fills are necessary.

4.4 No timber shall be cut or destroyed outside the right-of-way without first obtaining a permit from the appropriate owner. All timber cut, injured or destroyed in the construction of the transmission line shall be paid for at current stumpage rates.

4.5 Trees which are felled shall be cut within 12 inches of the ground. Stumps need not be removed unless conflict with a structure or guy anchor is involved.

4.6 On some sensitive lands, hand clearing may be necessary, and will be determined on a site-by-site basis.

4.7 Between towers where no traffic is required, vegetation shall be selectively cut to remove any interference with the conductors. Wherever appropriate, selective clearing will be done to produce curved or wavy boundaries. There shall be no removal of grasses or shrubs except as required for the pulling line.

4.8 Leveling at the tower site shall be limited only as necessary for positioning equipment. The same restrictions that apply to cut and fill on temporary roads will be required for these pads to effect site restoration.

4.9 Unless shrubs and trees within the construction area interfere excessively with equipment movement during construction, such vegetation will not be removed but will be marked for preservation.

4.10 In areas of over 4% sideslope, roads shall be constructed to a 4% outslope. The roads shall be constructed so that material will not be accumulated in one pile or piles. The materials will be side-cast as construction proceeds and will not be side-cast so as to make a windrow on the downhill side.

4.11 No cutting and filling shall be allowed in areas of 4% sideslope or less.

5.0 STREAM BEDS

5.1 Several ephemeral drainages will be crossed by the line and access roads. Clearing for roads and right-of-way shall be held to a minimum to reduce the potential for sediment entering these drains.

5.2 Roads shall cross drainage bottoms at right angle and level with the stream bed gradient whenever possible.

5.3 Blasting shall not be done in streams or near streams without adequately protecting the stream from debris.

6.0 FENCES AND CATTLEGUARDS

6.1 All fences crossed by this powerline shall be provided with a gate not less than 12 feet wide. All fences crossed by the line or access roads shall be "H" braced before the fence is cut.

6.2 Cattleguards, when required, shall be aligned at right angles with the roadway and shall be accompanied by gate of sufficient width to accommodate all oversized construction equipment.

7.0 EROSION

7.1 Erosion controls will be implemented in two stages: The temporary controls to last the duration of the construction activities and the permanent controls implemented by the clean-up crew at the time of road closing. The permanent controls are discussed in the road closure section.

7.2 Care shall be taken so that erosion problems do not develop below the construction site due to the channeling of water into new areas.

8.0 ARCHEOLOGY

8.1 In the event that any Indian relics or items with any apparent archeological or historical value are discovered during construction of the line, these relics or items shall not be touched, moved or otherwise disturbed. The Engineer shall be notified immediately upon discovery of these relics and items.

8.2 Title to any relics, artifacts, fossils or other items of historical or archeological value is expressly reserved in the landowner or agency having jurisdiction.

9.0 CONTROL OF FIRES

9.1 A fire plan shall be proposed that will set forth in detail the plan for prevention, control and extinguishing of fires on and in the vicinity of the project area.

9.2 Full compliance with fire laws and regulations shall be considered a necessity.

9.3 Blasting caps and powder shall be stored only in approved areas and always separate from each other.

10.0 WASTE DISPOSAL

10.1 General cleanup will be expected along working areas throughout the duration of the project to prevent littering.

10.2 Disposal of any materials, waste, effluents, trash, garbage, oil, grease, chemicals, etc., shall be subject to the approval of the landowner.

10.3 All used oil or other petroleum products shall be hauled away. There shall be no release of crankcase oil, etc., into streams or the soil anywhere.

10.4 Sanitary waste shall not be discharged into streams or any stream beds.

10.5 Water used in embankment material processing, aggregate processing, concrete curing, foundation and concrete lift cleanup, and other waste waters shall not be discharged into surface waters.

10.6 All non-combustible wastes such as conductor, ceramic or metal scrap shall be hauled away or buried. Permission shall be obtained from the landowner before burial.

10.7 Complete treatment of all slash created by the project will be required. Some slash may be used in connection with the barriers to inhibit travel on closed roads along the right-of-way. In other locations, slash will be piled up for disposal according to the Engineer's instructions.

10.8 Combustible wastes such as packaging material shall be hauled away and disposed of upon leaving any work area.

10.9 Generally, burning shall not be conducted. In instances where disposal by burning seems preferable, it shall require the prior approval of the landowner. This will be done with small fires for the disposal of construction waste only.

11.0 HERBICIDES

Herbicides will not be used during construction or maintenance of this line.

12.0 POST-CONSTRUCTION CLEANUP AND ROAD CLOSURE

12.1 All signs of temporary construction facilities such as haul roads, work areas, structures, foundations or temporary structures, stockpiles or excess or waste materials, or any other vestiges of construction shall be removed and the areas restored to as natural a condition as is practical.

12.2 Filling and plowing of roadways will be required where appropriate to restore the area to near natural conditions that will permit the growth of vegetation thereon and discourage future traffic.

12.3 Any landscape feature scarred or damaged by equipment or operations shall be restored as nearly as possible to its original condition.

12.4 In areas where no cut or fill was made, closure of roads shall be completed by barriers of berm, rocks, plants, or whatever, and signs after scarifying, water-barring and revegetation are complete.

12.5 Replacement of earth adjacent to access roads crossing water shall be at slopes less than the normal angle of repose for the soil type involved.

12.6 Disturbance of drainage bottoms will be minimal, and all bottoms shall be restored to their pre-construction gradient and width to prevent accelerated gully erosion.

12.7 Cross drains shall be added at an angle and frequently appropriate to road grades.

12.8 Drainage systems which have been interrupted shall be restored for all cleared centerlines.

13.0 GUIDELINES FOR CONTRACTOR PERFORMANCE

Construction contractors will accept the applicable guidelines when they accept the construction contracts and will be held responsbile for adherence to the guidelines. Adherence will be assured by monitoring their performance.

As a follow-up after construction, the following details will have to be completed, subject, nevertheless, to the desire of the landowner:

(1) Vegetation, particularly that of value to fish and wildlife, which has been saved through the construction process and which does not pose a hazard to the powerline, will be nutured and allowed to grow on the right-of-way.

(2) Cover will be maintained, if ecologically appropriate, in the areas immediately adjacent to transmission towers.

(3) Native trees, shrubs, herbs and grass will be retained, and where ecologically appropriate in critical areas, vegetation of this type will be placed under the direction of the appropriate land management agent and/or a qualified ecologist.

(4) If and where permitted, access roads and service roads will be maintained with grass cover, water bars and the proper slope in order to prevent soil erosion.

(5) Maintenance inspection intervals will be established so that routine maintenance will occur when access roads are firm, dry or frozen. Maintenance vegetative clearing in particularly critical areas will be done on a short cycle to satisfy minimal requirements and avoid heavy, longterm cutbacks.

(6) Aerial and ground maintenance inspection activities of the powerline facility will include observations of soil erosion problems, fallen timber and conditions of the vegetation that require attention. Aircraft will be used, where possible, to inspect and maintain the corridor.

Once the corridor is selected, engineering for the centerline and location of individual structures on the centerline takes place. The first step is to use the mosaics of the aerial photographs of the corridors. Applicants' Ex. 98 are aerial photographs taken by Teledyne Geotronics, Inc. under sub-contract with Chas. T. Main, Inc. of the preferred corridor. These photos are a true and correct representation of the area they purport to portray. There are 62 individual mosaics of the entire preferred corridor (taken before any construction or location of centerline on the Colstrip to Broadview line).

Using the mosaics and the individual photos, which have a 60% overlap, we carefully study the terrain and select a final centerline. This requires fixing co-ordinates of all angle points. Where permission is granted for survey access, panel points are placed at each angle in the line. These are large strips of white material which will be visible in the low level aerial photography.

The route is flown at low level following the panelling of angle points. Using photogrameterics, which is a photo mapping technique, plan and profile drawings are prepared which indicate a single centerline in the plan view and plots a profile of this centerline for elevations along the centerline, and also plots a second profile giving ground elevations approximately at a point underneath the proposed outside phase conductor location. Using these plan profiles, the actual location of individual structures is accomplished and proper clearances of conductors to ground are provided over open country and crossing of highways and railroads.

The location of each structure must be such that it will meet or exceed all requirements for strength and electrical conductor clearance above ground in accordance with the National Electric Safety Code. For example, the National Electric Safety Code provides a minimum clearance over highways of 34 feet for 500 kV and our design of the Colstrip line will in every instance required exceed that criteria. The National Electric Safety Code has been adopted to insure protection of the public health and safety.

Since a structure is required at each angle point (where the line direction changes), physical inspection on the ground is done when panels are placed so as to insure that angle points are placed in the best desirable location before the last aerial photos are taken.

For all free standing structures, examination is made of the low level photography to determine the relative elevation of the structure area to the structure center. This can be done by ground survey as well. Using this information legs for the tower are selected which will fit the terrain and eliminate the need for leveling the ground at each tower site. This eliminates scarring the terrain, stops erosion and side hill slipping. The towers are thus fitted to the terrain.

With guyed structures the uneven terrain is not a problem since guy lengths are adjusted during construction. Because the height of the tower structures vary by location from 120 feet to the cross arm to 70 feet, the amount of guy required will also vary, but in almost all instances anchors can be located within the 300 foot right-of-way required for the two parallel 500 kV lines.

In addition, in order to insure safety to the worker in the maintenance of the line, adequate climbing space is provided in accordance with the National Electric Safety Code. Also, construction specifications will require that all contractors must follow all codes relating to the safety and welfare of his employees, including the occupational Safety and Health Act.

One important engineering consideration regarding line and tower construction was to design to insure only minimum damage will occur due to vibration. There are three types of vibration which are of concern:

(1) Galloping or dancing conductors which is due to steady high winds and icing which produces a low frequency, high amplitude movement of conductors. There is no proven method for limiting this phenomen in a 500 kV line. While the use of Armor grip suspension units at a cost of over $650,000.00 was originally recommended in our study, it is now our belief that galloping will not cause conductor damage.

(2) Aeolian vibration is a high frequency, low amplitude

phenomena which can produce severe conductor damage at support points and spacer clamps. To prevent this damage we will utilize spacer dampers or Stockbridge dampers to stop the vibration.

(3) Sub-conductor oscillation occurs only on multiple conductor per phase designs and between spacers. Spacers are required to maintain sub-conductor location in the span. This sub-conductor oscillation occurs when a sub-conductor falls within the wake of a windward conductor. To prevent this oscillation, sub-conductor spacing can be increased or leeward conductors can be placed outside of the wake, or spacer dampers can be utilized. A combination of all these methods will be used on the Colstrip line.

These matters were the subject of our study done under my directions and control as is included in Applicants' Exhibit 81. Examples of spacer dampers are pictured in the Exhibit. Also, an example of the type of the spacer damper we propose to correct the oscillation is shown on the table marked "APPLICATION AND PERFORMANCE DATA" above 765 kV quad, being the diamond type (square turned at 45° to the horizontal).

As to the location of lines as they are affected by earthquakes, the study by Dr. Leonard Long of Duke Power Company for both suspension and strain towers verifies there is no likely damage to tower lines since the design for the ice and wind conditions previously explained are designed against a condition far worse than that of an earthquake with 0.5g ground acceleration. Thus no problem for even severe earth tremor (under 0.5g) is likely to be encountered on this Colstrip line.

Our System Planning engineers recommended the standard "Egret" conductor 636 kcmil 2-conductor bundle for 230 kV operation and 4-conductor bundle for 500 kV operation. This conductor selection was based on overall economic evaluation including both initial and future operational costs.

The available standard 636 kcmil conductors were then evaluated by me as to strength and stranding and it was decided that these were not suitable for the design criteria of 2" of radial ice without greatly reducing normal tensions and increasing tower heights. It was decided to secure bids on this standard "Egret" conductor along with two special high strength conductor designs. One type was the equivalent to "Egret" with an extra high strength steel core. The other was a 6201 aluminum alloy stranding in place of EC aluminum stranding but using a standard steel core.

The prices received for the special conductors were evaluated and compared with the standard "Egret" conductor but with an added factor for increased tower height. On the basis of the high priced bids received and the questionable availability of extra high strength steel core, it was decided to investigate the price of a larger standard conductor with sufficient strength to handle the 2" of radial ice. Bids were secured on standard "Mallard" conductor 795 kcmil 30/19 stranding. This larger conductor was studied on an overall economic evaluation which included the reduced corona losses, and was selected as the best choice of all these evaluated.

In conclusion the two Colstrip 500 kV lines running parallel to each other in a right-of-way 300 feet in width in carefully selected corridor will have minimum impact and be designed and constructed to protect public health and safety, and yet provide reliable transmission of Colstrip electrical energy. The lines are designed in accordance with accepted engineering studies and practice and all code requirements.

EXAMINATION OF EUGENE S. ZOBEL

Cross, by Northern Plains Resource Council

By Mr. Graybill:

Q Mr. Zobel, I see you have a Bachelor of Science degree in Civil Engineering?

A Yes.

Q Are you a member of the Electric Research Council or the Electric Power Research Institute?

A No.

Q Do you know what they are?

A Yes.

Q Can you describe them for us?

A The Electric Power Research Institute is a private, utility-funded research organization for the furthering of research into electric power.

Q As a matter of fact, it puts out a book, does it not, called "Transmission Line Reference Book, 365 kv and Above"?

A Yes.

Q You're familiar with that book?

A Yes.

Q And in fact, there was one put out before this. This is a new edition, is it not?

A The prior edition was not authored by EPRI, but --

Q By the Edison Institute?

A Right.

Q I notice in your statement on page 2 that you talk about making some studies in Peru. Was there a problem in Peru that you considered concerning earthquake problems of power lines?

A This was not a consideration in the feasibility study that we were working on at that time.

Q Was it one in the studies you conducted in conjunction with this line, the one we're studying here?

A The matter of earthquake design of transmission lines on the Colstrip project was covered to the extent that we were satisfied that the wind and ice load assumptions made far exceeded the loading which would result from an earthquake in the state of Montana.

Q Are you saying that earthquakes don't load lines? What's the similarity between earthquake difficulties and ice loading difficulties?

A An earthquake on any structure exerts forces on the structure from the ground -- there is ground acceleration, I believe, is the proper term -- and the movement of the ground shakes the structure and this creates stresses in the members. Now, this has been calculated to be lower stresses from such forces as expected in Montana than would result from stresses in the members resulting from wind and ice loads on the tower and wires.

Q In other words, while you did consider it, you considered that the strain and stress from the shaking of an earthquake would be less than in an ice storm or in a wind storm?

A That is correct.

Q Did you do that, mindful of the fault lines in Montana?

A We were advised of the fault lines. It's covered in the Westinghouse report.

Q You were advised only by the Westinghouse people, or were you advised by anyone else?

A I would say the Westinghouse report was the basis of our investigation.

Q Your Exhibit No. 70 shows a guyed Y-type tower. Why are you using guyed towers on this line? I understand a guyed tower to be more or less of a pencil point Y-tower, which is made to stand up by the guyed wires that go out at least in four directions, is that correct?

A That is correct.

Q Why are you using guyed towers on this line?

A I would say principally because of the economics of this type of construction, and secondly, in my opinion, it's a very good-looking structure, as a matter of aesthetics.

Q In other words, the guyed tower is cheaper?

A Yes, sir.

Q Why is it cheaper?

A Because of the nature of the design, the guys function as structural members, and there is total less cost on an installed basis.

Q Would another way of putting that be that you don't have to have as much steel in the tower?

A That's one of the factors, yes.

Q There isn't as much fabrication on it?

A I'd say there's probably as much fabrication -- close to it -- as much fabrication. The fabrication may be less costly.

Q It's simply a matter, then of aesthetics and of economics; in other words, cheapness, is that right?

A I think those are the two principal reasons, yes.

Q On line 11, of your statement, you state --

A Which page?

Q Page 5. We were talking about the guyed Y-structures. You say: "This structure will be used on the line where property owners do not insist on self-supporting structures." Is there some basis for that statement that indicates that property owners have a right, or at least can insist on self-supporting structures?

A What line is that, please?

Q Lines 11 and 12, sir, on page 5.

A At some point in time, I was advised that property owners were told that the guyed structure would not be put in agricultural areas.

Q Who told you that?

A I think this information came from the Montana Power Company.

Q When?

A I'm not sure of the time, sir -- fairly early in the project.

Q You're stating that -- tell me again what it is that Montana Power Company told you.

A Montana Power Company said that they had advised farmers that we would not put guyed structures on farmland; therefore, we didn't put them on the farmland.

Q So the distinction you're making in your oral testimony is between farm and non-farm land, but in your written statement, you say, where property owners do not insist.

A No, this is another factor. I'm sorry that I got off on the other subject. Pertaining to lines 11 and 12, if a property owner were to insist that he did not want a guyed structure, we were told that we had the self-supported towers available, and therefore, in order to get along with the property owner, we would install it at his insistence.

Q Who was in charge of contacting the property owners in this project?

A I'm not absolutely sure of the setup, but my understanding was that Mr. Jim Couture, of the Montana Power Company, head of their right-of-way department, was the man that directed the operation, and we were asked to assist in this, and we then had Universal Field Services to help us with that phase of the work.

Q In fact, didn't the management for the Colstrip group instruct C. T. Main to hire an agent to do the contacting up and down the right-of-way, because Montana Power said it could not handle that job itself?

A I believe that's correct, yes.

Q And as a result of that, your company was given the specific duty of finding a person to do the right-of-way work?

A That is correct. I'm still not sure that Montana Power Company didn't have some people involved, but this, I'm not sure of.

Q But you are sure that your company was directed to find a right-of-way contractor, isn't that true?

A Yes.

Q And in fact, you did that, didn't you?

A Yes.

Q And that was Universal Field Services?

A Yes.

Q For the initial portion of the line?

A Yes.

Q And as a matter of fact, it's still an open issue on the rest of the line, isn't it?

A What do you mean by open issue?

Q Well, I don't think that anyone has been finally hired, have they?

A I don't believe so.

Q Wasn't Universal Field Services contracted to C. T. Main Company?

A They were subcontracted to Main. That is correct.

Q So the line of responsibility for their work would be through your offices, wouldn't it?

A Yes.

Q Is it these people who were supposed to find out from landowners whether or not they wanted the guyed towers on their land?

A I must assume so. I don't know exactly the instructions given to them.

Q I don't know them, either, and because you mentioned it in your statement, I'm trying to find out what their instructions were. Do you know what the instructions from your company to Universal Field Services concerning finding out about guyed structures were?

A No.

Q Do you know whether it's true that property owners had a choice?

A I can only say that I assume that they were.

Q Was there a form that they filled out that showed what they wanted?

A There may have been.

Q Do you know?

A I don't know.

Q Can you say that it was the intention of your company and Universal Field Services to let every property owner have that choice?

A I don't know.

Q If you let some of them have it -- let me ask you this. Do you know, in fact, that there were some people who decided that they did want free-standing towers on their land?

A I believe I recall a few instances where this was a requirement in order to resolve the easement.

Q Can you say for sure whether or not that opportunity was offered to all the people on the line?

A I don't know.

Q You cannot say, then, to the Board of Natural Resources, that in fact, the people had a choice on this matter, because you don't know, do you?

A I'm reading lines 11 and 12 again.

Q Good.

A I think the statement in 11 and 12 stands. I wouldn't argue with what I've said.

Q Well, what I want to know is, whether the people along the line really had a chance to exercise any discretion on that matter?

A I don't know.

Q If they didn't, you don't want the Board of Health to believe that they were given any specific discretion, do you?

A I don't know how to answer that question.

Q Well, I could imply from lines 11 and 12 that everybody had a choice as to whether to ask for free-standing structures. I could imply that in the first reading of lines 11 and 12, and it would seem to me that if we left that impression with the Board, when you aren't sure of that, we might have misled the Board. I want to know if you know whether people really had a choice or whether this is just a statement that sometimes they got a choice.

A The statement, as made, was to indicate from the standpoint of structures available for use on this line, that it was our intention to use guyed structures wherever possible. We had to use, as stated on line 13, at changes in line direction, we would definitely put in a self-supported structure, and it was my statement here that we would use as many guyed structures as possible, but where property owners insisted on self-supported structures, we would use the self-supported structures. Now, as far as the details of what went on between the agents contacting property owners, I have no direct knowledge.

Q Would you go ahead and order free-standing towers without knowing whether the property owners wanted -- would you go ahead and order guyed towers without knowing the property owners might want free-standing towers?

A We would assume that we would put in a guyed structure in all cases unless told otherwise or unless it were on farmland, or unless it were at an angle point.

Q If you were aware that a landowner wanted to negotiate about the nature of the line, would you still go ahead and order guyed structures, until you'd found out what he wanted?

A If we were informed by Universal Field Services, through our Billings office, that there was some question about it, we would hold up in making any decision on that particular location.

Q Do you know of any instances where you were so informed?

A I mentioned earlier, I thought perhaps there were one or two cases where we were so advised, and we dealt with it as we were informed by our field people.

Q Would you agree with me that there may have been instances when landowners did not have an opportunity to discuss this matter with you or the company representatives?

A I have no knowledge of that.

Q You won't agree with me, because you don't know?

A I don't know.

Q And that means that you don't know that they were given the opportunity, do you?

A I said I didn't know the day to day procedures.

Q Your Exhibit 95-C, 95-B, and 95-A all show a variety of guyed structures in farmland?

A Yes.

Q You have now testified that along this line, you don't intend to use guyed structures in farmland, isn't that correct?

A This was because of the statement made to farmers that we would not do it.

Q So you're not going to make use of any guyed structures in farmland?

A We do not plan to do that between Colstrip and Broadview on this line that has been authorized.

Q Do you plan to use guyed structures in farmland anywhere along the two 500-kv lines that you're planning here?

A We have not reached that point in time for making that decision.

Q Well, if you would allow the farmers in the Broadview to Colstrip area to have free-standing structures, why would you insist on guyed structures for the rest of the line?

A I didn't say I would insist upon it, sir. I said it hasn't even been decided.

Q Well, when do you intend to decide that?

A We will have to decide that, hopefully, fairly soon, if we can get authorization for the building of the next portion of line.

Q Well, you've just made the statement a few moments ago that you did not use any guyed structures in farmland. You've now qualified that to say on the first 110 miles, isn't that right?

A That is right, because of a commitment made by the power company.

Q Is that commitment limited to the first 110 miles?

A I don't know.

Q Who would know? Aren't you the man in charge of this sort of thing?

A This commitment had been made by the power company.

Q Which power company?

A Mr. Couture, of the Montana Power Company, had advised farmers of this; how far that commitment extends, I have no knowledge.

Q Well, now, he didn't design the line in terms of towers, did he?

A No.

Q But he advised you that you couldn't use guyed structures on farmland in the first 110 miles?

A I was advised by Mr. Evans, the project coordinator, that this commitment had been made and we must stick to it.

Q Were you advised that the commitment was limited to the first 110 miles?

A No, sir.

Q Is there any reason for you to believe that it isn't going to be the rule for the rest of the line?

A I don't know.

MR. GRAYBILL: Mr. Hearing Examiner, if I'm not here when these exhibits are finally offered, I'd like the record to show that on 95-A, B, and C, I have a specific objection, because they are guyed structures in agricultural land, and the witness has just testified that he did not intend to use that at all, for the first part, and has no reason to know one way or the other, whether he's going to use it on the second part. It seems to me it would be misleading to put into the record pictures of towers which the witness has not used, and which he cannot now testify will be used on the rest of the line, so I'd like that objection at the time they're offered.

HEARINGS EXAMINER: Very well, the objection will be noted.

Q Now, let's look at page 8 of your statement, Mr. Zobel. On lines 16 through 18, there appears a sentence concerning soil sampling: "The practice is presently done in the construction of the Colstrip to Broadview line now under construction by the Montana Power Company..." Is that sentence truthful?

A As far as I know, yes. It refers to the previous sentence.

Q You work for C. T. Main Company, right?

A Yes.

Q Who does C. T. Main Company work for?

A It works for the power utilities for the Colstrip project.

Q And who are they, sir?

A This is the Puget Sound Power and Light Company, Pacific Power and Light, Washington Water Power, Montana Power Company, and Portland General Electric Company.

Q And what does C. T. Main do for that group?

A The engineering, what we consider the first stage of the Colstrip project, from Colstrip to Broadview.

Q Is that what you were hired to do, what your company was hired to do in December of '72 or January of '73, to do that first phase?

A We were hired to do the engineering for the entire project, and at some point in time, we were told that we had no authorization to proceed with anything beyond the first line from Colstrip to Broadview, and the rest, we should stop all other engineering.

Q Well, now, we wouldn't want the record to show that it happened just like that, would we, Mr. Zobel? The fact of the matter is, you were hired, your company was hired, to do the transmission studies and the engineering on two 500-kv lines from Colstrip to Hot Springs, isn't that right?

A That's right.

Q And substations and equipment and land acquisition through the way we've just talked about, by hiring a subcontractor; all of that was in the project scope originally, isn't that so?

A Yes.

Q And that's back in January of 1973, at the very earliest, isn't that right?

A That's right.

Q Or latest, I mean. Then, it isn't until the last year or so that you have been instructed to stop everything except the 230 line, isn't that so?

A I don't recall that it was as recent as that time. I think it was earlier.

Q Well, as a matter of fact, you did great and extensive work on the backgrounding and the studies on the total 500-kv picture, didn't you?

A Yes.

Q Do you have any idea in your own mind the percentage of the total project that you had completed before this so-called stop order you're talking about?

A The percentage of total engineering time -- I would have to be guessing, but I would say probably, of the total project, we've completed, perhaps, about 60% of the engineering, but that is the general engineering of the structure type, and so forth, which is a large part of engineering, and it doesn't involve the details of engineering, locations of towers, and this sort of thing, west of Broadview. We got started on that and were stopped.

Q Now, isn't it true, Mr. Zobel, that when this company was hired back in January of 1973 -- December, possibly, of '72 -- there wasn't, at that time, even a separate proposal for the present 230-kv Colstrip to Broadview line?

A That is correct.

Q In other words, the company started on the total project, and it was in the course of the total project that a determination was made to split off the 230-kv, the double 230-kv Colstrip to Broadview line, isn't that true?

A That's right.

Q And that recommendation was made by your company, wasn't it, to the five companies?

A I believe that it was a combined effort of the system planners working together to come up with what seemed to be the best plan for handling the situation for units 1 and 2.

Q Yes, but in the late spring or early summer of 1973, there were three proposals, one of which was a convertible line, and another of which was to withhold lines, and another of which was a 500 used as a 230 line. Do you remember those proposals?

A By proposals, you mean studies?

Q Right.

A Things to consider?

Q Yes.

A Yes.

Q And these proposals are alternatives and were studies and reports made to the combined power companies, the group, by your company, weren't they?

A Yes.

Q And the 230 line that you're talking about evolved out of these studies, didn't it?

A Yes.

Q So who is building the 230 lines now?

A Actual construction is by Jelko Construction Company.

Q And who hired Jelko?

A The contract probably is with the power company, the Colstrip management project.

Q Well, I think you're right, Mr. Zobel. I've looked at that contract today, and it's with the five power companies of the Colstrip group.

A The Colstrip group, right.

Q Is that what your statement says here on page 8, that the Colstrip group is constructing a power line between Colstrip and Broadview?

A No, that's not what it says. It says Montana Power Company --

Q I'd like to repeat my question. Is your statement there factual; is it true?

A Sir, I'm not sure of the arrangements with the Colstrip management project along the final financial arrangements on the portions of this line. Now, I treat this Montana Power Company statement here as not precisely necessarily owned by Montana Power Company, though it very well could be; I don't know.

Q It doesn't say anything about ownership, it says under construction, doesn't it?

A Terminology is what I'm talking about.

Q Wouldn't you ordinarily look to see who the contractor was when it's under construction? That's Jelko. We know that, right?

A I see what you're driving at now.

Q You've just told me who hired Jelko, haven't you?

A Yes. Now I finally understand what you're asking.

Q I would just like you to correct the record, or refuse to, when you say the Montana Power is building that line. The fact is, that the Colstrip group is building that line, isn't it?

A I would be willing to change this statement and say that the construction of the Colstrip to Broadview line is now under construction by Jelko Construction Company by the Colstrip management group -- contracted by the Colstrip management group.

Q You see, I just don't want the Board to be misled about the facts here, and I think this is incorrect in its present status, and if it is incorrect, I want you to explain why. All right, let's go on to another point. On page 7, line 11, you discussed the fact that -- well, you made a statement which I think is factual. You say wind and ice loads in

Montana are significant. Now, you really believe that, don't you?

A Yes.

Q Why do you believe that?

A Based, largely, on the meteorologists' reports from Meteorology Research, Inc.

Q Do you have any experience other than that upon which to base that statement?

A There have been examples of severe storms in this general area.

Q Are you familiar with a storm in the Colstrip area that knocked down some 230-kv power lines?

A Yes.

Q I think it was a Bureau wood pole line, wasn't it?

A No, sir, it was a Bureau steel tower line.

Q It was a steel tower line?

A Yes.

Q Was it a 230 or a 161, do you know?

A I believe it was a 230-kv steel tower line.

Q And it was in the vicinity of Colstrip? What caused it to go down?

A I believe it was west of Colstrip and north of the line now being constructed. I don't know the exact distance, perhaps 30 or 40 miles north of where we're building.

Q Why did it go down?

A The information we obtained from the Bureau of Reclamation was that it was an extreme buildup of rime ice on the wires, which caused the wires to break, resulting in approximately eleven towers to collapse.

Q Now, you don't live in Montana, do you?

A No.

Q You're a registered land surveyor in Montana, aren't you?

A I am a registered professional engineer.

Q Have you been in Montana much?

A Since the project, I have had quite a number of visits here.

Q Have you heard of other power line catastrophes caused by ice or wind in Montana?

A Yes.

Q For example?

A There were some wood H-frame lines recently hit by a very bad wind storm.

Q Where?

A I believe north of Billings.

Q What happened there?

A I don't know the exact number of structures -- I believe, in the order of 20 structures blown over in this wind storm.

Q You didn't happen to be in Montana until the last two weeks until today, did you?

A No.

Q There was a wind storm in Montana just less than two weeks ago, with winds of a hundred miles an hour at Browning. Could that cause significant damage to a power line?

A It depends on the design of the line. I think most lines would withstand that.

Q Probably it would depend on the conditions at the time, isn't that so, that is, whether it was cold or not, and that sort of thing?

A I think just probably a hundred mile wind would not have caused damage. If it were accompanied with ice, it would be different.

Q Are you familiar with other areas that have had difficulty with power lines caused by wind and ice?

A Are you talking about Montana or the United States or Canada or what?

Q Well, let's not talk about them all, but you're no doubt familiar with the case in Wisconsin, wasn't it, where sixty miles of line fell down, something of that nature?

A More on the order of seventy.

Q Seventy miles?

A Yes.

Q Was that caused by wind or ice, or both?

A There was a combination of wind and ice in that instance.

Q Do you mean to tell me, Mr. Zobel, that sometimes you can have combinations of wind and ice?

A Yes.

Q It isn't always one or the other?

A That is correct.

Q Are you familiar with a case about a year ago in -- I believe it was Maryland or Virginia -- where a federal line went down?

A I don't recall that one. Something might jog my memory, but I haven't found it to jog my own yet.

Q Well, let's not worry about that particular line. Let's talk a little more about what you did to prepare yourself so that you would engineer in Montana a line that would not fall down, because that's important, isn't it?

A Yes.

Q What did you do?

A We began with the hiring of MRI, we call it, and MTI made a study and submitted a preliminary report to us.

Q They made a study in the spring of 1973, isn't that right?

A It could have been then. I don't know the dates. I have an idea it might have started sooner.

Q Let's take Exhibit 87 in hand, and the third paragraph on page 1 of the introduction says that preliminary meteorology evaluation was conducted during the spring of 1973.

A What is the page?

Q Page 1, paragraph 3.

A Yes, spring of '73.

Q So that's the preliminary report you're referring to?

A Yes.

Q After you got that preliminary report, did you feel you knew enough to design a power line in Montana?

A We made our first conceptual designs and proceeded on the basis of that report, coupled with what we requested from MRI, and that was additional information. The first information we asked them for was on a 50-year return period analysis and we asked them to supplement that with a 25-year return analysis.

Q Let's examine proposed Exhibit 87 a moment. Now, the first sentence of paragraph 2 of this report -- well, let me ask you this. You hired this group, and this group of meteorologists or meteorology group -- where is it located?

A In California. I forget the city.

Q Altadena, it says on here.

A That rings a bell.

Q How did you get in touch with them?

A I had prior knowledge of their work in this field.

Q Had they ever worked in Montana before, to your knowledge?

A Not to my knowledge.

Q Had they ever worked for you on a power line before?

A Not to my knowledge.

Q Was there any one particular thing that caused you to hire them?

A My knowledge of their previous work for other utilities.

Q I see. They'd worked for other public utilities and given them meteorology reports?

A Yes.

Q Had they done any reports on that galloping line down in California that they had so much trouble with, meteorology-wise?

A I'm not aware of a galloping conductor situation. I'm familiar with a bad icing --

Q I can't remember the name of it. It goes over the pass down there.

Q I'm familiar with a bad situation in California that they helped people to evaluate it after the fact.

Q After the line had gone down?

A Right.

Q So here we were evaluating before the fact, weren't we?

A Right.

Q Let's look at the report, and specifically, the first sentence of the second paragraph.

A What page, please?

Q Page 1. "It was suspected that portions of the line might be subjected to heavy ice and wind loads." Is there some way that you or the meteorology group, to your knowledge, had of telling where the ice and wind loads might occur?

A I think the information contained in this report supports that they have some idea of this, yes.

Q Let's switch over to figure 1, which is the map. At someone's suggestion, six sites were selected, weren't they, to test the meteorology out? Are you familiar with that?

A I'm looking for the map. I have it now. That's correct.

Q And that's a map of the state of Montana, isn't it?

A Yes.

Q And it shows this line running from Colstrip in the southeast to Hot Springs in the northwest, right?

A Yes.

Q And you see the six sites marked there?

A Yes.

Q Now, let's talk about the ice problem. Do you know which sites had equipment for testing ice?

A I don't remember offhand.

Q Well, let me tell you, it's site No. 4 and 6, which you can verify in the report, if you care to. Can you tell me where the line you just referred to owned by the Bureau that is the steel-towered 230 line 30 miles north of Colstrip -- do you see where that would be on the map?

A Approximately, yes.

Q Now, if you knew that Montana was six or seven hundred miles across east to west, could you tell me how far site 4 is from the place where the Bureau of Reclamation encountered an ice problem on a 230 steel-towered line?

A That would be probably between -- oh, 300 miles.

Q Somewhere in the neighborhood of 300 miles away, right?

A Right.

Q And site 6, 375 to 400 miles away, right?

A That's close.

Q Do you think that testing the icing qualities of this line 300 miles from the site of a known ice storm on a similar type line, a steel-towered line, is a good way of determining where the icing might occur?

A I think that the purpose of the test sites is perhaps not clarified in this report, and the purpose of the test sites is to try to choose areas subject to extreme icing and to advise whether or not this is a good location for a line, or whether special designs may be necessary.

Q Well, the two sites chosen, site 4 and site 6, are mountainous sites, aren't they?

A I belive so.

Q Are you telling us that icing is more prevalent in terms of power line icing in the mountains than it is not in the mountains?

A That's not a correct interpretation. There are locations within the mountains, mountain passes, the location of the pass with regard to bodies of water, such things, which meteorologists understand, and they can study moisture accumulation, wind directions, and come up with recommendations, but they still like to use these test sites to get some better information.

Q Do you know of any mountain site in Montana where icing has caused a power line break?

A Did you say in the mountains?

Q Do you know of any mountainous site in Montana where icing has caused a power line break?

A I'm not familiar with any.

Q But you've already told us that you know of at least two, and maybe more non-mountainous locations in Montana where icing has caused power line failure, right?

A Yes.

Q So with your knowledge that there had been failures in non-mountainous areas, you nevertheless chose to test only in the mountainous areas? Is that what happened here?

A That is what is happening here, but it again comes back to the purpose of the test sites. The test sites are to try to determine whether even more severe ice may occur in these locations than in the general area of Montana.

Q Well, the sentence that we read says that it was suspected that portions of the line might be subjected to heavy ice and wind loads. Was there any effort made here to find out what portions of the line that might be?

A I think the sites are an indication of an effort in that direction, yes.

Q Let's think for a moment, Mr. Zobel, as just human beings, about our experience. Icing occurs on lines when moisture builds up in a freezing condition, isn't that right?

A Yes.

Q So you have to have both moisture and freezing to get that, don't you?

A Yes.

Q Moisture doesn't build up if it's very, very cold, does it?

A I believe that's a correct statement.

Q Whether or not it applies to all cases, wouldn't it be true that one of the cases you're familiar with from your experience that causes icing is a situation where the temperature is not terribly low, but it is below freezing and yet there's a driving rain or a sleet, which freezes when it hits the lines? Isn't that a fact?

A Yes.

Q Now, that's a condition that you're very likely to find in the plains in Montana,isn't it?

A Yes.

Q You're familiar enough with our weather to know that, aren't you?

A Yes.

Q Why do you suppose Meteorology Research didn't think that was significant?

A I think it's a matter of relatively, what is significant. Are you talking about no ice, or are you starting from a point of ice requirements throughout the line, or perhaps something larger in severe areas?

Q Well, is it true that what you were trying to test when you had Meteorology Research do this study was the icing likelihood of some very severe passes in Montana, at which you placed testing sites?

A Yes.

Q And you were not really concerned with the icing conditions in the state as a whole, then, but rather with the specific bad locations that you were worried about, is that true?

A Based on the information in this preliminary report, we had already decided that the icing in the state of Montana is, in my judgment, already significant, and the statement made here, "significant," we're probably talking about something even larger, perhaps, if the test sites indicated it.

Q Are you sure that the preliminary report mentioned icing at all?

A That's my recollection.

Q Do you have a copy of it with you?

A This is Exhibit 87, isn't it?

Q No, it's not.

A Is this the final report?

Q That's right, sir, your exhibit.

A I don't have the preliminary report, but I am fully aware that they did talk about ice recommendations.

Q And yet they made that preliminary report in the spring of 1973?

A Yes.

Q They obviously, then, did not make it from empirical studies.

They made it just from studying records, is that it?

A I don't know all of the factors that these meteorologists include, but they make a thorough research of available data, along with study of wind directions, moisture accumulations, and that is expertise, and they make recommendations of what might be expected on whatever they're asked to do, a 50-year, a 25-year return period.

Q Isn't it true that the Meteorology Research, Inc. group was very unsatisfied with the 3-month test and unwilling to give you very firm recommendations based on such a short period of time, isn't that true?

A That is true, but it pertains to the test sites, where we were worried about perhaps even more severe icing.

Q So in spite of the fact that this group gave you a preliminary report where they said they were not happy with the scope of their examination, you went ahead and designed the line based on the report, on the preliminary report, not this exhibit, but the preliminary report?

A That's right.

Q Even though they told you they hadn't done enough study, you went ahead and made -- designed the line, based on that report?

A Yes.

Q Then you allowed them to go ahead and put in test sites to test certain high mountain areas and certain high wind areas that you thought might be specifically dangerous, is that right?

A Potentially dangerous, yes.

Q And that's what Exhibit 87, the final report, pertains to, is that correct?

A Yes.

Q On page 1, again, it says in the first line of the last paragraph that the report presents analyses collected during the winter of 1973 and 1974. Is that the only period covered by this report?

A It's the only period covered by the test site -- information from the test sites. I'd have to reread this entire final report to see if it repeats some of the information that occurred in the preliminary.

Q Let's turn to page 7 and see what the report says. Did the group that did this report feel that the winter of 1973 and 1974 was a good year to use as a test year?

A They said not.

Q Pardon me?

A They said that it was not a good year because it was -- let's find the words here. They seemed to indicate it was more of an average year.

Q In other words, they warned you that this year might not be the kind of a year in which you'd experience the worst conditions?

A Yes.

Q And they warned you that the winter before had been much more severe, didn't they, but that they hadn't had any records kept that winter?

A That's right.

Q They said, in fact, on page 7, that it was a winter which lacked strong winds and moisture content, didn't they?

A Yes.

Q And yet on the basis of that year, you went ahead and designed the line, on the study of that year only?

A The line was designed prior -- the conceptual designs -- understand, these are conceptual designs for fabricators to place a bid, and this never actually took place. We are still holding these conceptual designs, so the design as such is not a final design, for one thing, and secondly, we don't know where the lines are going west of Broadview, so these sites, perhaps, if we had more information, could be irrelevant, so we do intend to test more when we finally determine where the line is going.

Q Since 1973-1974, we've had two winters now. Are you testing this winter?

A No.

Q Did you test last winter?

A No.

Q Well, are you telling us that you might not be able to complete the design until you've done another winter's tests?

A We would proceed with our present design, as far as I'm concerned, if authorized to do so, on the basis of our work to date and on the basis of information gained from this report, but we would intend to, based on the final line routing, if authorized, we plan to then select some sites along that final routing and get as much information as we can about possible extra-severe areas, and at that time, we have a choice of doing something special, design-wise, or possible small relocations of the line. We have alternatives that we can follow without affecting the entire design for all of the other portions of the line if they're not subject to these severe spots.

Q But you've done none of this testing in the last two winters?

A That is right. I don't think testing when we don't know finally where the line is going to be located would necessarily be economical.

Q You're certainly going to have passed up the data in these general areas for two winters, aren't you? You could have been gathering data.

A We could have gathered data for two more winters at these sites and it could have been useful if the line finally is located there.

Q What if the winter that evolves after you get the right to go ahead, assuming you do, happens to be a warm winter? What would you do then?

MR. PETERSON: Objection -- speculation.

HEARINGS EXAMINER: Overruled.

MR. PETERSON: You may answer.

A It's difficult to say what I would do if that should occur. We would probably consult with the experts, ask for their advice, and make the best judgment under the circumstances.

Q What if the experts advise you to take some more tests before you've finally constructed the line? What would you do then?

A I don't know, sir.

Q Is it possible that that might cause delay in the construction of the line, Mr. Zobel?

A I think that's possible.

Q We're talking about a double 500-kv line now, aren't we?

A Yes.

Q If you delayed the construction of the double 500-kv line, Mr. Zobel, what would that do in terms of making available the power from Colstrip 3 and 4?

A Well, let me back up, if I may.

Q Can't you answer that? Is that a tough question?

A Yes.

Q It's not tough conceptually. Is it tough because you don't like the answer?

A No, it's tough because I'm not an expert on the effects of the delays.

Q You mean to tell me that you don't know those two 500-kv lines are absolutely essential to put the power from Colstrip 3 and 4 onto the grid? Don't you know that as an engineer?

Q From what I've read, I'm told this is very important, but I'm trying to say I can't quantify it. Any delay is serious on a project if you believe the schedule as established, and I'm not the one that set the schedule.

Q Well, you're the one that's designing -- one of the major persons designing the 500-kv transmission lines?

A Yes.

Q And you've just said that there might be, under the circumstances we discussed, a delay, and I've asked you what the effect of that delay would be in getting the power from Colstrip 3 and 4 onto the grid. Isn't it obvious what the effect would be if you didn't have the power line ready?

A Quite serious and quite costly.

Q It would delay it, wouldn't it?

A Yes.

Q Would that delay be caused by attorneys in your opinion, Mr. Zobel. You don't need to answer that.

A Could I back up and make one --

Q Your counsel will give you an opportunity. We're getting along all right. I want to get through here, if I can.

A All right.

Q Let's turn over in the meteorology Exhibit No. 87 to page 11. It says that the winds during this particular winter when they recorded them were only 39 miles an hour at the site where they'd expected them to be heavier and that this was because the site was parallel -- the winds were going parallel to the proposed line. Do you intend to choose a site where the winds blow parallel, or isn't the worst case when the winds blow perpendicular to the line?

A The line routing is not generally possible to direct the direction of the line to suit the wind directions.

Q Well, I would agree with that, but it is possible to choose a site so that you study the wind conditions where they're perpendicular rather than parallel, isn't it?

A Yes.

Q And this says that you chose a site, whether rightly or wrongly, that the winds turned out to be parallel to the line. It would not seem to me that that would give you the most dangerous case, would it?

A Yes, it would seem so.

Q You think it would give you the most dangerous case?

A I'm agreeing with you that this is probably not the best location if this is actually the fact. The winds generally parallel the line.

Q Well, that's what the report says, so site 6 really didn't accomplish the purpose we were looking for, then, did it?

A It doesn't seem so.

Q We might have to do it over if we wanted to be careful about that type of situation, is that right?

A At that location, yes; probably choose another site.

Q At the bottom of page 11, you mention this matter of asking them for a 25-year return period, and a while ago, you mentioned that you initially asked them for a 50-year return period. Isn't it true that although you initially asked for a 50-year return period, you asked them to make their report based on a 25-year return period?

A My recollection is that asked for the 50-year return period, and then, having read it, asked for the 25-year return period additional information.

Q Well, is Exhibit 87 the 25-year return period?

A Again, sir, I'm not sure. It would seem to me that it includes both 25 and 50, since we asked for both.

Q Well, look at the next page, page 12, table 3.

A It is a 25-year return period.

Q Look at table 6, which is on page 18, and let me tell you, my study of this exhibit, I can't find any 50-year figures. Now, you tell me whether it's a 25 or a 50-year report?

A This is a 25-year report.

Q And you're telling me that you got a 50-year report from them?

A Yes.

Q But you didn't make it an exhibit in this case?

A It's not an exhibit, to my knowledge.

Q Do you still have a copy of it, or has it been destroyed?

A It would be in my office.

Q Will you supply me with a copy of it, please?

A Yes.

Q Would you agree to append it as Exhibit 87-A? I'm not here all the time, and I'd like to get it in the record.

MR. GRAYBILL: Is that all right, Jack?

MR. PETERSON: You'll be here one or two days and will have an opportunity.

Q Now, Mr. Zobel, tell me whether the worst case is going to show up in a 25-year period or in a 50-year period report.

A The worst case would occur in a 50-year time period.

Q So the worst case would not necessarily show up in Exhibit 87 and would show up in the report that's still in your files?

A Right.

Q And yet on page 12, on table 3, in sites 2 and 3, you found conditions equal to or greater than the line you designed for in peak 5-second gust winds, didn't you?

A I don't think that's a correct statement.

Q Well, you designed the line, as I understand it, from your testimony, for 120 miles an hour winds and two inches of radial ice, isn't that right?

A One or the other.

Q Yes, not both at the same time, but one or the other, but those were the outside criteria, isn't that right, 120 miles an hour winds and two inches of radial ice?

A Yes, but there are several kinds of winds.

Q Does the 120 miles have to blow for a specific period of time?

A Yes. We call it a steady wind and that needs to be defined and there are several definitions of it, but it certainly isn't a 5-second gust.

Q You've read the methodology that the meteorology group used here?

A I'm sure I have.

Q Can you tell whether the 5-second gust lasted only five seconds, or does it mean that at one time, they measured five seconds and then, later on, they measured again? Do they know whether it sustained itself during the intervening period?

A I don't think I can answer that, because I don't remember.

Q How high do you think the wind would have to be in a 5-second gust, to be dangerous to your 1.2 inch line? That's the diameter of the conductor, as I understand it, is that right?

A I don't think that's right, either.

Q Is the conductor thicker than that, or thinner?

A I think it's smaller.

Q Pardon?

A I think it's smaller.

Q What do you think it is?

A I believe -- from my memory, I would say it is 1.14 inches in diameter.

Q Then why did the meteorology group use 1.2 in their study here?

A I don't know, sir.

Q You're aware, aren't you, that the reason I said 1.2 is that that's what the study said it was based on.

A I wasn't aware of that. We studied many conductor sizes.

Q Let's get back to the problem, and that is, you know the conductor you're talking about and the difference between 1.14 and 1.2 may be significant, but let's take 1.14. How long would the wind have to blow at 120 miles an hour to affect that kind of a line, in your opinion?

A Well, we probably would refer to this maximum one-minute average windspeed.

Q So you think it would be significant as a minute?

A I think so, yes.

Q So the fact is, that in this average winter, there was one site within five miles of that during an average minute, right?

A Right.

Q How high a windspeed do you think you'd have to have to affect your conductor, your line, for a 5-second peak gust?

A Probably at least 1.2 times the maximum one-minute speed, the reason being that --

Q 144 miles per hour, is that what you're saying?

A Something like that. That would be the type of gust that you might expect.

Q And so this same site experienced a peak -- I'm talking about site No. 2 -- a peak 5-second gust within 7 miles per hour in this average year of one that you think would affect your line, is that correct?

A That's correct.

MR. PETERSON: Where did you get 7? I get 9.

MR. GRAYBILL: I think your map is better than mine, Jack. I think it is 9, the difference between 135 and 124.

Q Let's turn to page 13. The first full paragraph there talks about what ought to be done at site 4. They say that you ought to go to the south side of Horse Butte. Has that change been proposed by you to the combine in terms of routing?

A No action has been taken since this final report on these sites as far as relocation or any such thing.

Q Now, this final report was made -- what date, do you know?

A There doesn't appear to be a date on it. I'll guess some time in the middle of '74.

Q So that although you said a while ago that one of the reasons you did these sites was to make changes, when the meteorologists made a suggestion, nothing was done about it, is that right?

A Yes, sir, for the reasons stated, that we're not sure if the line would be finally located on this route.

Q So what you're saying is, maybe you'll follow their example and move it somewhere else?

A Yes.

Q Were you aware that at one of the ice sites, the ice machine didn't work for a period of about 30 days during January?

A I'm aware of that.

Q Does that make you a little uncertain about the results in terms of ice loading at that site?

A I would say, with the overall report here of its being an average winter, and the recommendation to do more testing, I was hopeful that we would get more information,so this one month of lack of operation at that particular site did not upset me too much.

Q Who recommended doing more testing, Mr. Zobel?

A It's been in discussion with Mr. Evans, the project coordinator.

Q Has your group, C. T. Main, recommended more testing?

A I said we've had discussions with Mr. Evans. The recommendation for more testing is right here in this report. It's a question of whether or not the project management likes to do so.

Q Well, what has been the recommendation of the engineers, C. T. Main?

A To do more testing.

Q So in other words, you have recommended more testing?

A Yes, eventually.

Q In other words, you aren't satisfied with the meteorology report, either?

A Not as we look at what we still have ahead of us yet. We have information that is useful --

Q And yet you're telling me that testing is not being conducted this winter?

A That's right.

Q And wasn't conducted last winter?

A That's right.

Q Is there some reason the testing should be delayed?

A The best reason, I think, for delay, is if we knew this was the final line route, I would ask the power companies to authorize us to proceed. If we knew we were getting the authorization to build a line, I certainly would be recommending it.

Q The meteorology testing was not one of the more expensive things in the preparation -- in the design of this line, was it?

A No.

Q So expense is really not the whole reason, is it?

A I don't know the reason.

Q I'm interested in finding out the reason for the delay in the meteorology testing if you know. Do you know any reasons for that delay?

A The best reason I can give is again, at some point in time, we were told to stop any work west of Broadview. That would include site testing, everything.

Q Mr. Zobel, there was a time when several alternative routes across Montana were considered, isn't that true?

A Yes.

Q Routes as diverse as northern Montana versus southern Montana, right?

A Yes.

Q Then there was a period of time when the route was pretty much tied down to the central Montana route through Broadview, near Helena, on to Hot Springs, right?

A This was the basis of our evaluation, as well as Westinghouse.

Q And in fact, there have been rather specific lines, actually corridors, established, within which you expect the line to be built, don't you?

A I don't know whether I would use the word expect -- hopeful. We went to the point of flying this course.

Q Yes, as a matter of fact, you went to the point of photographing it, didn't you?

A That's what I meant by flying it.

Q That's quite a bit more expensive than the meteorology report, wasn't it?

A I'm not sure of that.

HEARING EXAMINER: Let's take a recess.

(HEARING RECESSED AT 3:20 P.M.)

Following a brief recess, the hearing reconvened at 3:40 P.M. on February 10, 1976.

HEARINGS EXAMINER: Go ahead, Mr. Graybill.

CONTINUATION OF EXAMINATION OF EUGENE S. ZOBEL

Cross, by Northern Plains Resource Council,

By Mr. Graybill (continuing):

Q Mr. Zobel, a while ago you said that this reports recommends more testing, which it does, and as I understand, you recommended more testing. Now, what I want to know is, you said this, and I wrote it down, we're still holding the conceptual designs; what do you mean by that?

A Well, we had prepared conceptual designs for the towers for the straight 500 KV design, and these conceptual designs are ready for issue for securing tower fabrication and supply of towers.

Q And why are you holding them?

A Because we were told to stop all work on the 500 KV considerations.

Q Do you consider the meteorology testing that you've done so far to be adequate to allow you to complete the design in this line?

A We have no reason not to proceed with the conceptual designs as prepared based on this report, with the reservation of making changes if we find additional information with further testing suggests that we should.

Q Well, how how can we determine what is the proper routing for the line until we've done further testing?

A I think the routing of the line must be selected on the best judgment possible, and having authorization to follow that route, that is the only reasonable time on which to begin placing these temporary weather stations.

Q Well, didn't you recommend to the five companies a proposed route?

A Yes.

Q Isn't that one of your functions?

A Yes.

Q And have you tested that route out thoroughly now?

A Not to my satisfaction, as this MRI report indicates, only one average winter.

Q And you're saying that the report and, in fact, your company want further tests on that routing; isn't that true?

A If the Colstrip project management authorizes us to proceed, we will.

Q Surely. I understand that you can't do it unless you're told to, but you're telling me that you want further testing on the routing you've proposed; is that correct?

A Only if that is the acceptable route.

Q How do we know if it's the acceptable route if we haven't tested it?

A I don't believe the routing, sir, would be determined on the basis of testing for meteorological data.

Q Well, aren't we trying here to find out where -- to site a line, isn't that one of the problems in this case? Don't you understand that to be the truth, or the fact?

A Yes.

Q If we're trying to find whether or not to site it in a particular place, don't we need to know the conditions that prevail along the line we're going to site?

A This is a recommendation, yes.

Q Are you satisfied that you have already the meteorology data necessary to determine that this is the best site?

A I don't think I said quite that. I said we have sufficient data to proceed with the design of 500 KV towers, subject to reservations which we would exercise if we find additional information suggests we make changes.

Q Would this mean you might change the route?

A This could mean changing the route, or beefing up the design in specific areas, if such information shows that it's needed.

Q In other words, you might change the tower design in addition to the route, or in place of changing the route?

A We may shorten the tower spans; we may increase the conductor sizes in some special, serious locations, if that were considered necessary.

Q What are your recommendations with respect to that matter now?

A Do not do anything about it now.

Q Because the route is right?

A The route is not finalized, and until we have information that suggests that these areas are, in fact, subject to more severe wind and icing, we don't expect to do anything.

Q How will you get that information?

A Through further testing when we locate the final centerline.

Q And how will we locate the final centerline if we haven't tested?

A Well, sir, it sounds like you're suggesting we do a lot of testing on a route, and if it looks like it's not good, then reroute. We'll never get a line built if we do that. That's not the procedure.

Q What is the procedure?

A You have many other factors for selection of a line route. The location of the final centerline is ducted in small locations for various reasons. As you proceed with further investigation on a particular route, you may have reason to make deviations.

Q Well, isn't it true that you, as an employee of C.T. Main, and on behalf of C.T. Main, to the five companies here, did recommend a preferred route?

A Yes.

Q And are you satisfied that, meteorologically, that route can be sustained?

A Yes, providing we make further testing, and if we are unable to get the testing, we will evaluate what are considered critical areas and decide whether to strengthen them or not to. Or whether to make minor reroutes.

Q But you have recommended that additional testing be done in those areas?

A Yes.

Q Those areas are known to you?

A They don't differ very much from the sites shown in this map. I think if we engage MRI to do this further testing, they would probably recommend adjustments in these sites, and we'd probably accept these recommendations.

Q And then you'd change the routes, or change the towers, in that site, if they recommended a change?

A If the evidence indicates that it is not sufficient for our present design.

Q And that's precisely what they did at that point which we already referred to where they suggested you go around the Side Horse Butte; isn't that right? Page 13? First paragraph?

A What paragraph is it?

Q The first full paragraph.

A It made a specific recommendation, that's right.

Q And so far, you've done nothing about it?

A That is right. That doesn't suggest that I will not, but we've done nothing to this point.

Q Yes. Maybe something will be necessary, but you haven't done it yet?

A That is right. We were stopped from doing any further work.

Q I understand that the company stopped you. The owners stopped the engineers from going any further in tower design and in route selection; right?

A That's right.

Q All right now, is that true east of Broadview, too?

A East of Broadview, the authorized construction of a single tower line, double circuit construction, we had engineered that on the basis of having a parallel 500 KV line in the future, and we were told to stop work on that parallel line the same time we were told to stop work on the 500 KV west of Broadview.

Q Have you completed your meteorological testing east of Broadview?

A I don't believe there was to be any to the east of Broadview.

Q You don't believe there's any necessity for meteorological testing east of Broadview?

A I don't think so.

Q Even though that's where the Bureau of Rec lost its seventeen towers, or whatever the figure was?

A That is correct.

Q You still don't believe there's any testing necessary?

A Right.

Q You don't intend to do any more testing out there; is that right?

A That's right.

Q Even for the 500 KV line?

A That's right.

Q But you have not completed the engineering for the 500 KV line?

A That is right.

Q Have you completed the routing for the 500 KV line?

A Our routing plan was to parallel the first line, so the routing is complete. Even the recommended routing changes by DNR included the paralleling.

Q What's the difference between rime ice and -- what's the other word we use here? What is rime ice, let's ask it that way?

A Rime ice is difficult for me to describe. It has a different density than clear ice. There are other types of ice. I think hoar frost is one. There's a glaze ice, rime ice, and wet snow.

Q What is rime ice? That's my question to you. Do you know?

A I don't know the proper definition of it. As I say, it has a different density than clear ice.

Q Is your line designed for two inches of rime ice; is that right?

A No, sir. It's designed for two inches of radial glaze ice.

Q Radial glaze ice? That's different from rime ice?

A Yes.

Q And how does it compare to rime ice? If you know.

A It's a greater density and heavier.

Q Which is greater?

A The glaze ice.

Q Do you know the ratio between the two?

A That information, I think, sir, is in the report. I don't know it that well to recite what the difference is.

Q All right. Let's look at page 17 of the report. The first sentence of the conclusions is, very little in absolute conclusions can be drawn from one seven-month sample of data. Is that the sort of conclusion on which you decided that more testing was necessary?

A We anticipated, sir, that we would have more than one winter of testing to start with. It was never our intention to have just one winter of testing.

Q Well, then, why didn't you insist on some testing the second and third winters?

A Because we were instructed to stop work on the 500 KV.

Q Isn't that delaying your getting facts on which you can base a route and a structure?

A I don't think so because we are not sure of that final centerline authorization.

Q But, getting together information about the climate and the meteorology of Montana surely you need to -- and when it takes a year to gather that information, surely you need to gather it as quickly as you can, don't you, or whenever you can?

A These mobile weather stations record the weather at a particular location and they are not relevant to the wind and ice which may be expected in very large areas.

Q What are you doing to collect information on the very large areas?

A This information was given to us in both the twenty five year and fifty year return period recommendations.

Q You're aware that this report says there were no severe icing periods during the winter in which it was taken?

A Yes.

Q And you're aware of their recommendation, it is strongly recommended that another winter of data be collected? You're aware of that?

A Yes.

Q And yet, the power companies here have not seen fit to have another winter of data collected; is that true?

A At this time.

Q And yet, you have a preferred route selected at the present time, don't you?

A Yes.

Q And they have not seen fit to collect data even in your preferred route for these last two winters; is that true?

A Yes. I might point out that the twenty five and fifty year return period recommendations, or report, I should say, is not based on information obtained from the seven month testing at these weather stations. These weather stations are seeking local information.

Q Is the temperature a significant factor in your line design? Minimum or maximum temperatures?

A No, not serious, no.

Q Table 5, of course, does tie itself to your six sites, doesn't it, on page 14?

A This is specific information on the sites 1 through 6 as far as temperature.

Q And Table 3 is specific information on winds for those same six, isn't it?

A Where's Table 3?

Q It's on page 12.

A Yes.

Q And Table 2, on page 10, is that specific?

A That is specific with regard to these sites.

Q So the fact is, that part of the report is based on the sites and part of it's based on other information; isn't that true?

A That's right.

Q Mr. Zobel, showing you what's been marked for identification as Exhibit number 3, it's a letter on the letterhead of Meteorology Research and it's addressed to Mr. Einar Greve. Who's Mr. Greve?

A Mr. Greve is the project manager of the Colstrip project.
Q And for your company; isn't that right?
A That is correct.
Q Are you familiar with this letter?
A Yes.
Q What is it? What, generally, is it? Well, let me help you. Is it a letter from Meteorology Research concerning the scope of the work that they've done and what they wanted to do in the future?
A Yes.
Q And does it recommend that more testing be done?
A Yes.
Q And, showing you proposed Exhibit number 4, which is a letter on the letterhead of your company from Mr. Greve back to the project manager, Meteorology Research, do you recognize that?
A No, I don't.
Q Well, do you want to look at it and see if you understand what it is?
A Yes.
(PAUSE TO COMPLY.)
A I have the gist of it now.
Q Basically, it's an answer to the letter which is Exhibit 3, isn't it?
A Yes.
Q And do you recognize Mr. Greve's signature?
A Yes.
Q And can you say that it's a letter that Charles Main wrote to Meteorology Research?

A Yes.

Q And does it discuss the possibility of further meteorology testing?

A Yes.

Q And is this in line with your statement a while ago that you do recommend such further testing?

A Yes.

MR. GRAYBILL: We'd offer 3 and 4, your honor.

HEARINGS EXAMINER: Do you have any objection, Mr. Peterson?

MR. PETERSON: I don't know anything about them. I have never seen them.

Q Mr. Zobel, just a few general questions. First of all, on these pictures, I read your statement to say that these pictures were taken in Indiana; is that right?

A That is correct.

Q And they're taken on various size lines; is that true?

A Predominantly 765 KV lines. There are some 345 KV lines.

Q Do you know what the maximum -- I mean, what the minimum height above ground these lines were?

A I do not know exactly.

Q Do you know the size machinery that did the cultivating under these lines?

A I do not know.

Q Do you know whether they were wheel tractors or crawler tractors?

A I don't know.

Q Do you know the width of machinery pulled by the tractors that did the cultivating under these towers?

A I don't know.

Q Do you know the crops seeded?

A I believe, predominantly corn.

Q Do you know how much corn there is along the proposed route of this transmission line that we're dealing with here?

A I don't know.

Q Do you know how much corn is raised in Montana?

A I don't know.

Q Would you disagree with me if I told you that wheat was a much more predominant crop than corn along this line?

A I think I could agree with that.

Q Do you know the height of the machinery that was used under the lines shown in the exhibits?

A No.

Q Do you know the height of the machinery used predominantly to cultivate wheat fields in Montana?

A No.

Q Are you familiar with Exhibit number 82, The Electrostatic and Electromagnetic and Corona Effects of 500 KV Transmission Lines?

A I would have to see it to identify it.

Q It's a report prepared for the Montana company by the Charles T. Main Company is April, 1975?

A I think I recognize that, yes.

Q Were you an author of this report?

A I'm not sure until I look at the report.

(WITNESS REVIEWS REPORT.)

A Yes, I participated in one of these enclosures.

Q The report seems to have photostated in it several pages, from time to time, of some other book. It's got an article, for example, Calculating Electrostatic Effects in Overhead Transmission Lines, by Don Dino. Do you know the source of this material?

A That is not the portion of the book that you're holding that I had anything to do with.

Q I asked you whether you knew the source of it.

A You mentioned the name of Dino?

Q Yes.

A I believe he's an engineer with General Electric Company. Yes, it says, General Electric Company.

Q Do you know the source of that material? Is that a report out of some other book or manual? Do you know?

A It says at the bottom here, technical paper presented at the IEEE Power Engineering Society at the winter meeting on January 27-February 1, 1974.

Q Which portion of this report did you have something to do with?

A Appendix 2.

Q Is that a study of electromagnetic and electrostatic effects under 500 KV transmission line?

A This was a simple test with fluorescent tubes underneath high voltage lines, to indicate when and if they actually did glow under operating lines.

Q Did you find that fluorescent tubes did glow under a 500 KV line when you held them up?

A Yes.

Q You found that to be the case?

A Yes.

Q I believe I read this report in, perhaps, its preliminary form. I haven't read this particular text. As I understood it, you went to a 500 KV substation, or to a power line owned by the Duke Power Company near Rock Hill, South Carolina, in December of 1974 at 10:00 A.M., and then again at night, and maybe in the afternoon. You went two or three times to this power line and tested it; isn't that right?

A Yes.

Q How many different times did you test it?

A Once in the daytime. I believe we tested on two separate occasions at another location. I guess, in all, we must have made three trips testing different lines.

Q When you tested the Duke Power Company lines, how much -- what were the current conditions on the line at the time?

A I don't know the electrical current. I know it was an operating 500 KV line. That's all I know.

Q Can't a 500 KV line operate at different rates?

A You mean at different voltages?

Q Yes.

A We recognize that they generally operate plus or minus, we call them, 500 KV.

Q They operate, you've told me previously in a deposition, up to ten percent plus or minus; isn't that right?

A Well, it could be ten percent above 500 KV at the generation end.

Q And it could be ten percent below; isn't that true?

A I'm not sure that I said that. I may have --

Q Is the 500 KV line either on or off? Are there variations in the amount of power that can be put over it?

A The power varies, but the voltage pretty much remains in the ball park.

Q Okay, explain to me how the voltage stays the same and the power over it varies?

A I don't understand it myself. I'm not an electricial engineer.

Q But the amount of power really can vary when it's going over it, huh?

A They're delivering power, and I don't understand the electrical terms.

Q Well, how much power was going over this line when you tested it?

A I don't know.

Q How much power was going over the 765 KV line when you tested it?

A I don't know.

Q Do you know how much power was going over any of the three lines at the time you tested it?

A No.

Q Do you know what the voltage on the lines were at any of the times when you tested them?

A No.

Q You don't know the voltage of any of the three lines that you tested?

A No. I know the nominal voltage of the lines I was testing, nothing more.

Q Surely you know the name of the voltage, which you've testified to me previously is not always what it's operated at, right?

A Right, but you asked me did I know the exact voltage that was going over the line. I didn't know that at that location.

Q And you didn't test it at that location, did you?

A No.

Q It is possible to test, isn't it?

A I don't know.

Q Is it possible to calculate from a field strength?

A I suppose this is possible if you have the right equipment, but I didn't attempt this at all.

Q Do you think it might make any difference to what might happen under a line, how much power was going over it, or at what rate it was being operated?

A These were really irrelevant to the kind of test we were running. We were trying to find out if the tubes did glow under an operating 500 KV line and 765 KV line.

Q Well, you found out that the tubes did glow, didn't you?

A Yes.

Q And in that sense, you actually confirmed Mrs. Louise Young's tests, who also found the tubes glowed, didn't she?

A It confirmed that they glowed just as she said, but it was additional information which we also found out.

Q Well, just a moment ago you told me, Mr. Zobel, that the purpose of your test was to find out if the tubes glowed?

A That was one part of the test, right.

Q Both you and Mrs. Young found out that the tubes glowed, right?

A That is right.

Q But then, you made some conclusions additional to that about her competence, or her tests, other than the fact that it glowed, right?

A We found out additional things which she didn't indicate, which were quite pertinent.

Q Did you find out the assertion by Louise Young that the tubes would glow under these EHV, extra high voltage, lines was false?

A It was not false. It was incomplete.

Q But you don't know how much power was going over the lines that you tested?

A No.

Q Do you know how much power was going over the lines that she tested?

A No.

Q You mean you have compared her test with yours without knowing how much power was going over the lines?

A That's right.

Q Do you know whether or not the amount of power going over the lines might make a difference in the tests?

A That might make a difference, but it's not relevant to what we found out.

Q Do you know at what voltage the lines that she tested were being operated?

A Only the nominal voltage.

Q So you don't know the voltage at which her tests were taken?

A No.

Q You don't know if the voltage on the line that you tested was the same as the voltage on the line she tested?

A That's right.

Q And yet you attempt to compare the two results?

A Not directly. We were trying to experiment and find out what were the facts as far as when a tube would begin to glow.

Q Well, since you don't know the voltage, nor the amount of power being transmitted over the lines that she tested, and since you don't know the voltage and the amount of power being transmitted over the lines that you tested, can you be certain that your test and hers were similar?

A I didn't say her tests and our tests were similar. We extended our test to things beyond, apparently, what she did.

Q Well, you can't tell that, because you don't know at what rate that they were operating, do you?

A I'm speaking of things other than the operating voltage.

Q You would agree with me, would you not, that there are circumstances under which -- let's say, there are circumstances and there are voltages and there are amounts of power transmission under which 500 KV lines can be safely operated?

A Would you repeat that, please?

Q Wouldn't you agree that there are voltages and there are amounts of power transmission which can safely be used on a 500 KV line?

A Yes.

Q And would you agree that there are voltages and there are power transmission capacities -- I'm not much of an engineer either -- at which a 500 KV line cannot be safely operated?

A I wouldn't agree to that.

Q You don't think there's any voltage at which a 500 KV line can't be safely operated? How about 735 KV? Is that a voltage at which a 500 KV line can't be safely operated?

MR. PETERSON: Objection. Immaterial.

HEARINGS EXAMINER: Overruled.

Q You may answer.

A I don't think it's a reasonable question, because the terminal equipment for a 500 KV line is not sufficient to do such a thing.

Q Well, let's be a little more reasonable. You and I have talked one time about this before. Suppose you operated a 500 KV line at 560 KV. Is that possible?

A I believe that's possible on some systems.

Q And would that necessarily be safe?

A I would say yes.

Q How about 570?

A I would again say that would probably be safe.

Q How about 590?

A I think you're getting into the realm where I said it's not practical for the terminal equipment. Again, I'm not an electrical engineer and do not know the terminal limits, so you're getting out of something I should be discussing.

Q What I'm asking is, as a theoretical matter, can't a line be operated unsafely, voltage-wise or power transmission-wise? Isn't that possible? I'm not saying it should be done. Isn't it possible to operate the line unsafely, even a 500 KV line?

A Not the way the systems are being built in this country.

Q It's not possible to operate one unsafely?

A That's my opinion.

Q It would just depend on how high the line was above the ground?

A It would depend on many things. But, if it were unsafe to begin with, it would be unsafe to operate it at any of these voltages. They don't build them that way.

Q Are you saying that it's impossible to put more power on a line than it's safe to put on the line?

A No, I didn't say that.

Q Well then, is it possible to put more power on the line than is safe?

A I don't believe so for the systems that are built in the United States.

Q Do you know at what distance from the ground the lines Mrs. Young tested were tested?

A You asked me this before.

Q No, I didn't. If you don't understand the difference, I'll repeat the question, but do you know at what distance from the line, how much between the ground and the line, how much minimum distance, she tested?

A No, I don't.

Q Do you know at what minimum distance you tested?

A Approximately --

Q Did you measure it?

A Yes.

Q How?

A With a telescoping hot stick.

Q So you're not sure whether your distance and hers were comparable?

A I'm not sure, no.

Q Are you an authority on electromagnetic and electrostatic effects of 500 KV lines?

A No.

Q One last series of questions, Mr. Zobel. At a meeting held on August 23, 1973, at the PGE office in Portland, Oregon, attended by many representatives of the five -- many engineers from the five companies involved here -- there was a discussion and the minutes of that meeting, which I'm looking at, say under the first item, Mr. Zobel explained the criteria by which he was working included designing the line for the minimum cost and for the optimum reliability for any SC heavy loading. Is minimum cost the prime criteria by which C.T. Main designed the two 500 KV lines here in question?

A Consistent with good engineering practice.

Q The answer is yes?

A Yes, consistent with good engineering practice.

Q And in the judgment of the engineers, wherever it was still good engineering, you did whatever was possible to cut the cost; is that right?

A Yes. That's part of good engineering.

Q And for example, the decision to build for two inches of clear ice, instead of two and a half or three inches of clear ice, is made because you believe that two inches is reasonable and you built to the minimum standards for two inches; is that right?

A We believe that this was good engineering practice.

Q And you did build a tower which likely would not withstand two and a half inches of ice; isn't that true?

A It's clearly stated that it was designed for two inches of radial ice.

Q And it's designed for 120 miles an hour winds; right?

A Or 120 mile per hour winds, right.

Q Or, and not and?

A Correct.

Q In each case, the elements of this power line were designed to the minimum necessary to accomplish those standards?

A I would say yes.

Q And that's because cost was told to be -- you understood that cost was a major factor, to keep down the cost?

A Again, I didn't have to be told. This is our job, to do good engineering at minimum cost.

MR. GRAYBILL: I think that's all.

HEARINGS EXAMINER: Mr. Peterson, you want to register any objection to Northern Plains' Exhibits 3 and 4?

MR. PETERSON: No.

HEARINGS EXAMINER: Very well. They're admitted, Northern Plains' 3 and 4. Mr. Shenker?

MR. SHENKER: You didn't ask me if I had any objections.

HEARINGS EXAMINER: Oh, yes. Do you have any objection? Did you get to see them?

MR. SHENKER: No, I didn't get to see them.

HEARINGS EXAMINER: Okay. You have no objections?

MR. SHENKER: But a man of such impeccable good taste as Mr. Peterson registering no objections, it would certainly be unseemly of me to register any under the circumstances.

Cross, By Department of Natural Resources and Conservation,
By Mr. Shenker:

Q Mr. Zobel, I'll try not to repeat the areas of examination that Mr. Graybill went through with you, but there'll be some nuances of concern that I have that I wasn't quite clear on in the examination that he conducted. One is on the subject, Mr. Zobel, of the design for radial ice, when you said it's designed for two inches or for a 120 mile an hour wind. Let's take a look at the two inch radial ice design by itself. At what wind speed will those towers fail with two inch radial ice?

A Zero wind.

Q Let's take a look next at the 120 mile per hour wind speed. Would I correctly infer that without any ice accumulation at all, those towers would fail?

A Yes. Fail, or just withstand. It's the breakover point.

Q Right. 120.0001 would do the job?

A We're not that good.

Q What combination of wind speed and radial ice will also cause the towers to fail?

A I don't recall these figures. We, I believe, specified two combinations which, to us, were reasonable combinations. In one case, an accumulation -- I don't recall whether it was three-quarter inch radial ice at 40 mile per hour, but that sort of thing, and we had two different combinations included in our design.

Q I take it, in your design of these towers for your transmission lines, unlike what we were told in connection with the generating stations that are part of our discussion here, you can't send an operator out to the tower with some kind of a switch to turn in order to save the tower from failing when you have two inches of radial ice. When that happens, you have a failure, right?

A That is right.

Q Similarly under windy conditions like the one at which you predict the failure? Nothing can save that when those natural phenomena occur?

A That is right.

Q Mr. Graybill did ask you some about the pictures in Indiana which you brought to this proceedings, Mr. Zobel. You had some of those pictures with you when your deposition was taken in Portland last year. Have you ever seen a condition in which a piece of farm machinery came into contact with a tower, doing damage to both?

A I have not seen the damage to the equipment. I have seen damage to towers.

Q Extensive?

A No.

Q Extensive damage to equipment reported to you?

A I'm not familiar with whether it was or was not.

Q In any of those circumstances, sir, was damage done to human life or to animals?

A None that I'm aware of.

Q Have you ever heard of any problem in connection with a tower on a transmission line interfering the path of progress -- interfering with the path of progress of a piece of farm equipment? Or an automobile, or a truck? Have you ever heard about that happening?

A You're talking about a case of an automobile colliding with a tower?

Q Yeah.

A Of course. There have been accidents of this sort.

Q On any of those occasions, sir, have the damages done to the towers been sufficiently extensive as to result in some outage, even of a minor nature?

A It depends on many, many things. I have known of lower voltage lines where, very definitely, this has happened.

Q Sure. Ever seen any pictures of that?

A Pictures of the destroyed structure?

Q Yes.

A Yes.

Q Did you bring any of those with you?

A No.

Q Did you bring with you anything today, Mr. Zobel, that would show the kind of problem against which you have tried to take precautions for engineering of these transmission facilities?

A I don't think I understand that question.

Q Well, there's no reason to be so cautious and consistent with engineering practice unless you're designing against problems; that is, you want to avoid problems occurring, right? Why have 37 foot overhang on your transmission wires? Why not have 18 foot overhang on transmission wires?

A We design to practical limits that we think make sense for the conditions where we're building. We must meet certain minimum safety requirements, which we do.

Q What are those all about? Why? What's the safety requirement for?

A To avoid people accidentally getting killed underneath transmission lines from too low wires and this sort of thing, so there is a minimum specified in the code, below which you should not build.

Q How does that happen that people get killed under transmission wires that are too low?

A Accidents, I suppose, is the only way I can answer it.

Q Well, what kind of accidents, Mr. Zobel?

A Well, if you meet the safety code, there probably aren't any accidents unless people do something foolish.

Q What's the safety code trying to engineer against, or provide for?

A I didn't hear that.

Q What's the safety code trying to engineer against or provide for, depending upon how you want to look at it?

A The safety of the general public.

Q I'm trying to find out whether this is just some sort of a machination of a dreamer's mind, or there are some real problems for which the safety code is intended. Are there some real problems of the accidents that you have described to me, or are they just makeup dreams and we shouldn't worry about them?

A Well, you started out by talking about accidents where the structure is damaged by automobiles colliding with it, or a train wreck.

Q Does that happen?

A These things, I have said, have happened. We all know about these things.

Q How do people get killed under wires?

A By doing foolish things, I'd say.

Q Such as?

A I can cite one instance that I'm familiar with, on a low voltage line, where a man was working with a sailboat, an aluminum mast, and he simply tilted the boat up and didn't bother to concern himself with the overhead line, and this happened to be a mast tall enough to get into the wires. This was an accident. This was one instance I can cite.

Q Did it kill the man?

A I don't remember whether it killed him or not.

Q I take it the process by which he was injured was that the metal, the aluminum, was a conductor which would allow the energy current to pass down from the wire to the man?

A That's right.

Q Well then, whenever we'd have a conductor that could breach the gap between a wire and an individual, then we'd have a problem that we should engineer against, right?

A That's right.

Q So if I had a piece of farm equipment that happened to have some conductive capacity in length or more than 37 feet, then I've got a problem?

A That's right.

Q Similarly, for those areas where you think 41 feet is the more appropriate, even then if I had length of more than 41 feet of material that would be a conductor, I've got a problem, right?

A Right.

Q And those problems occur some places, don't they?

A Not that I'm aware of. Not anything of the magnitude that you're talking about.

Q What magnitude am I talking about?

A You just mentioned some equipment 41 feet high.

Q Oh, I see. You've never heard of a piece of equipment 41 feet high?

A I'm not aware of any.

Q Okay. Have you ever seen a picture of an individual who has been electrocuted as a result of conduct of energy from a transmission wire?

A No.

Q Wouldn't you imagine it doesn't look quite so idyllic as the pictures that you brought for us in Exhibit number 95?

A Exhibit 95 being the --

Q A, B, C, D, E?

A These are the pictures of the lines across farms?

Q Yes.

A I don't quite get the question. Would you repeat it, please?

Q Well, I think we can just let it pass. In your statement, Mr. Zobel, you refer to the corridor proposed -- I'm not going to ask you about what you mean by proposed corridor, Mr. Graybill got into that sufficiently -- but whatever that proposed corridor is, it has 98.4 circuit miles of farm land to be crossed. What's a circuit mile?

A A circuit mile is the same as a tower line mile, if there is only one circuit on the tower.

Q You mean, it's a mile through which a tower is running with one circuit?

A With one circuit on it, yes.

Q Well, if you had two circuits, why would that make any difference in your computation? You're still running through the same amount of farm land, aren't you?

A But the area taken up by one circuit on one tower line is different from the area paralleling it. I'm assuming a parallel line is what you're talking about.

Q Ah then, you must be talking about square miles in your computations?

A I don't think so. What computations are you speaking of?

Q I don't know. Why don't you turn to your statement and we'll take a look? Page 11. Line 24. It says, 98.4 circuit miles of farm land will be crossed. How would that make it any different if it was two circuits rather than one circuit? Would you have more miles of farm land being crossed, or more square miles of farm land in which there would be a tower?

A It makes a difference in that we are talking about two parallel single circuit lines. They occupy space within a 300 foot corridor. If you had one line, there would be, perhaps, less farm land crossed on a per lineal distance of the entire line, because some farms may stop halfway into the right of way. One circuit may cross a farm, but the parallel circuit may not cross it.

Q Are these lineal miles?

A This says circuit miles, which means we've considered how many farms stopped and are affected only by one of the circuits.

Q So wherever you run your tower, if you're not going across a piece of farm land, that wouldn't be included in the computation that appears on page 11?

A That is right.

Q So if we were to stretch out your tower, as proposed on some corridor on a transmission line, and try and chart the number of miles of farm land you're going through, we'd find something of a patchwork quilt, wouldn't we? You go for a while through farm land, then you stop, and then you pick it up later on, you go through farm land, and then you stop?

A That's right.

Q Now, on the next page of your statement, Mr. Zobel, you refer to total acreage removed from production as 5.69, as distinguished from the total acres which Westinghouse thought would be lost to production, and they were in disagreement with you by a factor of fifty to one?

A That looks right, yes, sir.

Q They were wrong, right?

A They made an assumption which I don't agree with.

Q And what was their assumption that was so wrong?

A They assumed that there would be no farming under any guyed structures.

Q You say that they would assume little farming within the confines of the guys and tower?

A Right. They excluded that from their estimate.

Q Did you have a discussion with them on that point?

A I don't recall.

Q Were you aware of that observation by them in the environmental analysis that they prepared?

A Probably.

Q Did you bring it to their attention?

A I don't remember.

Q Have you brought it to anybody's attention in the past?

A Yes.

Q Whose?

A The Colstrip project management.

Q And in response to your having brought that to their attention, did they convene a meeting of some Westinghouse representatives and you and themselves so that they could discuss and resolve the disagreement?

A No, I don't believe I gave them this information until after the Westinghouse report was complete.

Q Well, some of those Westinghouse reporters still live and thrive, in fact, and have been in this very room and sitting in the very same chair where you're sitting right now. They are still around. Couldn't they come in to confer on the subject of who's right and wrong, in the spirit of truth?

A I suppose so.

Q Did you invite them in?

A No.

Q Now, you still regard yourself as a contractor to the Colstrip project management, do you not?

A We have an engineering contract, yes.

Q And you take your instructions from the client, right?

A Instructions of what kind are you speaking?

Q What you're supposed to do?

A The scope of work? Certainly, certainly.

Q And in particular, the good gentleman who's been squiring you about today, Mr. Evans, is the coordinator who maintains contact with you?

A Right.

Q Now you would certainly accept Mr. Evans' instructions as to the binding effect of the construction guidelines for the transmission lines, wouldn't you?

A Yes.

Q Mr. Zobel, some time ago you were aware, were you not, that plans should have been made to measure audible noise, radio interference and TV interference along the proposed corridors, whatever they might be, some time prior to construction, in order to obtain base line data, right?

A Yes.

Q Has that been done?

A I was told it was done in the area of the Colstrip to Broadview first line. Whether it was done elsewhere, I do not know.

Q Let me put it to you this way. Have you been informed that that recommendation from C.T. Main has been met across the line from Colstrip to Hot Springs?

A I cannot answer that because I don't know.

Q Well, you've been informed, or you haven't been informed?

A I asked the question whether these tests had been conducted, and they said yes, but it was not qualified as to what extent. I'm not sure it went beyond Broadview.

Q Have you seen the results of any such tests beyond Broadview?

A No. I wouldn't be interested, really.

Q Why not?

A Because ambient records aren't very meaningful.

Q Is base line data meaningful?

A Only after you get later data. This is a base line data and so if somebody records information as it is today, it isn't impressive to me.

Q Well, you're not telling us, are you, Mr. Zobel, that it isn't important or useful for us to know now what the possible radio interference or television interference and the like would be on the proposed line?

A I didn't mean to infer that. It's important and I'm just not interested in looking at the present status of results.

Q And the reason that you're not interested personally in looking at that yet, is that you'd want to be able to look at comparative data when they would be available? After you'd built the new transmission line, then you'd want to look at the data?

A Then I'd be interested.

Q Okay. I think that's consistent, sir, with what I understand your position to be, that, basically, this environmental monitoring of transmission lines and their effects, isn't state business anyway, is it?

A Is what?

Q Is not state business, is it?

A I don't think I can answer that the way you've stated it.

Q Well, you regard the proceeding which you find yourself now, do you not, Mr. Zobel, as sort of an annoyance?

A I'm an annoyance, you say?

Q Surely I would not say such a thing, sir. And certainly not to a pleasant man like yourself. But I understand your philosophy to be that this kind of a proceeding is an annoyance to you because the state shouldn't be getting into your affairs in monitoring transmission lines, making tests, and determining corridors and their effects. That's your philosophy, isn't it?

A I did record in my letter concerning the DNR report that I felt that this was something that the power companies could handle very nicely.

Q Well, that puts it diplomatically, Mr. Zobel, but I'm afraid that we're on the record and you're under oath, and you're going to have to tell me the answer to my question, which is:

While the power companies can handle it nicely from your standpoint, the state shouldn't mix in, right?

A I don't recall exactly the words I used, but it's on record that I didn't feel that it was necessary for them to be involved constantly monitoring all of this, rather than letting the power companies run it.

Q Your view is that when problems arise, if they arise, that those should be worked out by the power company and you don't need the state to interfere?

A That's essentially correct.

Q I have a sort of a side question to ask you, Mr. Zobel, that I don't think you and Mr. Graybill discussed, but this one business in which the C.T. Main folks were involved on the correct configuration of the conductor to use on the transmission line, the context of that was that you were doing your work in a period, 1973, in which materials were not readily available to supply the demand that you would have if you chose some, perhaps, otherwise preferable design. That's the context, right?

A I'm not sure that's quite correct. Do you want me to state it the way I recall it?

Q Sure. If you disagree with that, tell me that you don't agree with that.

A I don't agree with that exactly.

Q Do you know that that's Mr. Green's view?

A I read his deposition and I don't think his opinion is probably any different from mine. I read his deposition. That may be the way he said it.

Q That's the way he said it, and his opinion is not different from yours?

A I don't believe it's that different as far as what I've said and what he said. They may differ a little, but the intent was we had a problem at that time with certain materials.

Q One of the facts of the matter is that certain things follow from the conductor size that you did choose, and the configuration of bundles that go with that conductor, right?

A I believe we had already selected a bundle of four, and a recommended conductor size diameter-wise.

Q When you use the Mallard as opposed to the Ingret, you're dealing with a larger conductor that's going to require greater tower strength in order to support those conductors, and other consequences follow from the use of the Mallard as opposed to the Ingret; isn't that right?

A That's right. I think your reference should really be to Ingret, which was the final selection.

Q You are now dealing with Mallard now, aren't you?

A We're dealing with Mallard now.

Q One of those consequences which flows from Mallard, as I understand it, is that the greater size conductor which the Mallard is, results in a greater tendency for ice buildup; isn't that correct?

A That is debatable, because --

Q Which side are you on in that debate?

A I don't believe it's been conclusively proven that there is significant difference in ice buildup between the two sizes we're talking about.

Q You would agree with me, however, that you told me last spring of the recent research then that had demonstrated that the larger the diameter of the conductor, the more ice it collects.

A I think I even sent you a copy of that.

Q Yes. Not only did you do that, but you did it promptly, which I appreciated. By the way, Mr. Zobel, I noted with some interest the manner in which you and Mr. Graybill got along just fine during his examination. Were you a little bit surprised to find out that John Evans had told the new project manager from C.T. Main not to communicate with Mr. Graybill?

A I had no knowledge of that.

Q Oh sure, you remember when we were in Portland and we took your deposition and Mr. Ender's deposition, and Mr. Taylor's deposition, that that letter was marked as an exhibit during Mr. Taylor's deposition. Weren't you around then?

A I may have been but I certainly don't recall it. It was in my deposition, or Mr. Ender's?

Q Well, it's a multiple choice quiz with three choices and the third one was Mr. Taylor. Mr. Taylor's deposition, Exhibit number 2, was a letter from Mr. Evans confirming that he had some time before advised Mr. Taylor as the project manager of C.T. Main, and succeeding Mr. Greve in that capacity, not to communicate with Mr. Graybill or any of his representatives, or give him any information.

MR. PETERSON: Objection. Immaterial.

HEARINGS EXAMINER: Overruled.

Q Did that surprise you at all, sir? Does it now?

A I have no way of answering that because I don't know for what reasons he might have said it. He might have had good reason, I don't know.

Q Well, he was nice to you today, wasn't he?

A Yes. I'm not bleeding yet.

Q Had you been in on the discussion, Mr. Zobel, that led up to the C.T. Main work on the transmission systems necessary to build the Colstrip units 5, 6 and 7?

A I read about this in Mr. Greve's deposition and I knew nothing of any of this.

Q That wouldn't have been your area of concern, I take it, for C.T. Main? Now, you did discuss with Mr. Graybill the -- and rather extensively at that -- the hold order that was put out on the engineering work to be done by C.T. Main, the instructions that came from the client, the owners and operators of the Colstrip project management, but I think the context of that hold order is important for us to note for the record. It was somewhat broader, as I understood it, than what you and Mr. Graybill were discussing. It went to entire systems analysis for the transmission line, did it not?

A I don't know that.

Q The hold order, I take it, in the ordinary course of events from Colstrip to C.T. Main would come from John Evans to Chet Taylor?

A Probably to Einar Greve. He was still with us, I think when the hold order was issued.

Q The hold order is March 10th, 1975, so by then Einar Greve was at Tucson Gas and Electric.

A He was?

Q He left C.T. Main on January 22nd, 1975. Mr. Taylor did succeed him, did he not?

A That is right.

Q Well, in Mr. Taylor's deposition, he testified that on March 10th, 1975, he had informed the people at C.T. Main working on the Colstrip project that effective immediately a hold was placed on all system analytical transmission and substation design studies except for those directly associated with the studies then underway on the environmental concerns that had already been commissioned. You knew about that, didn't you?

A Only because you remind me of it. I don't know that I was even at Mr. Taylor's deposition. And I didn't read his deposition.

Q Now Mr. Zobel, you've been to Russia some time past, have you not, trying to talk with the Russians about their studies on the effects of transmission lines?

A That was not the purpose of my visit, but this was certainly a topic of our -- one of the topics discussed with the Russians.

Q When you returned from your 1974 visit to Russia, you were concerned enough about the discussion about electrostatic effects and audible noise adjacent to high voltage lines, that you expressed your concern on that subject and wanted to make sure that some safe acceptable levels were established before unrealistic standards would be set by OSHA; isn't that right?

A That is correct.

Q What's OSHA?

A Occupational Safety and Health Act.

Q Have you set the Russians straight now so that they're not making their mistakes about determining that the effects of transmission lines are worse than we think they are?

A Thank you for the compliment if you think I can do that. We still have ongoing discussions with the Russians on this matter.

Q They think the effects are worse than we do?

A I wouldn't agree with that statement.

Q No?

A No, sir.

Q I thought the Russian studies with which you and some others have differences in this country showed that there were, indeed, transmission effects on people. Weren't those the studies?

A The Russian paper, secret paper of 1972, indicated some ill effects on people and this is what has stirred up this matter and it is the intent of the American engineers and Russian engineers to pursue it and find out what the facts are.

Q And that's still under way?

A Yes, sir.

Q When your deposition was taken, Mr. Zobel, last spring, I think we had a semantic problem on the question of transmission effects upon biological life, and you had excluded agriculture from biological life for the purposes of your discussion with me on that subject. You would agree, would you not, that transmission lines do result in interference with agricultural pursuits?

A I don't think I would agree with that from any information I have.

Q Really? You think that there is no agricultural pursuit interfered with in any way by the presence of transmission lines?

A If you're talking about the space taken by the towers, that's another story. If you're talking about the growth of any plantings that would be affected by it, I would say there's no knowledge that I have that the growth of any vegetation around the lines is affected. The space taken up is another matter.

Q What is that other matter.

A Simply that you've occupied some land and it's impossible to farm within certain limits of the tower.

Q Mr. Zobel, when your deposition was taken, sir, there was marked as an exhibit to your deposition a memorandum of January 17, 1973 from Einar Greve to one of the ladies in your office in Boston, as I recall, Mrs. Ecknoyan I think her name is. Would you have that handy? Number 5?

A Yes, I have it in front of me.

Q Good. In that memorandum, the statement is made by Mr. Greve as the then, and original, project manager from C.T. Main, that this project had started with plans for the two 350 megawatt generating units and added the two 700 megawatt units. The plan developed gradually during the fall of 1972, but while it was going on, the Montana Power Company submitted a request for a certificate of convenience from the Montana Board of Health for the construction of the two 350 megawatt units. Now Mr. Greve makes the observation that that certificate would be issued some time in the spring of 1973, as far as the client expected, and that the clients, they are anxious not to introduce the two 700 megawatt units and the 500 KV transmission plans in the picture at that time, January of '73, since that might delay the issuance of the certificate for the two 350 megawatt units. Now, when I had a chance to talk with you about that exhibit on your deposition, at that time you didn't know why it was so hush-hush. Do you know now?

A No, sir.

Q Did you ask anybody since?

A No.

Q Can you speculate?

MR. PETERSON: I'll object to the speculation.

Q Surmise?

MR. PETERSON: I'll object to the surmise.

HEARINGS EXAMINER: How about guess?

MR. PETERSON: He said he didn't know.

HEARINGS EXAMINER: It's sustained.

Q Why do you think?

A I would think that it might have some effect on the second application, perhaps.

Q Why?

A I really don't know.

MR. SHENKER: Okay. I have nothing further. Thank you, Mr. Zobel.

HEARINGS EXAMINER: We will recess until 9:00 tomorrow morning.

(RECESSED AT 5:00 P.M.)